AUGUST 1, 1931

Railway Age

FOUNDED IN 1856

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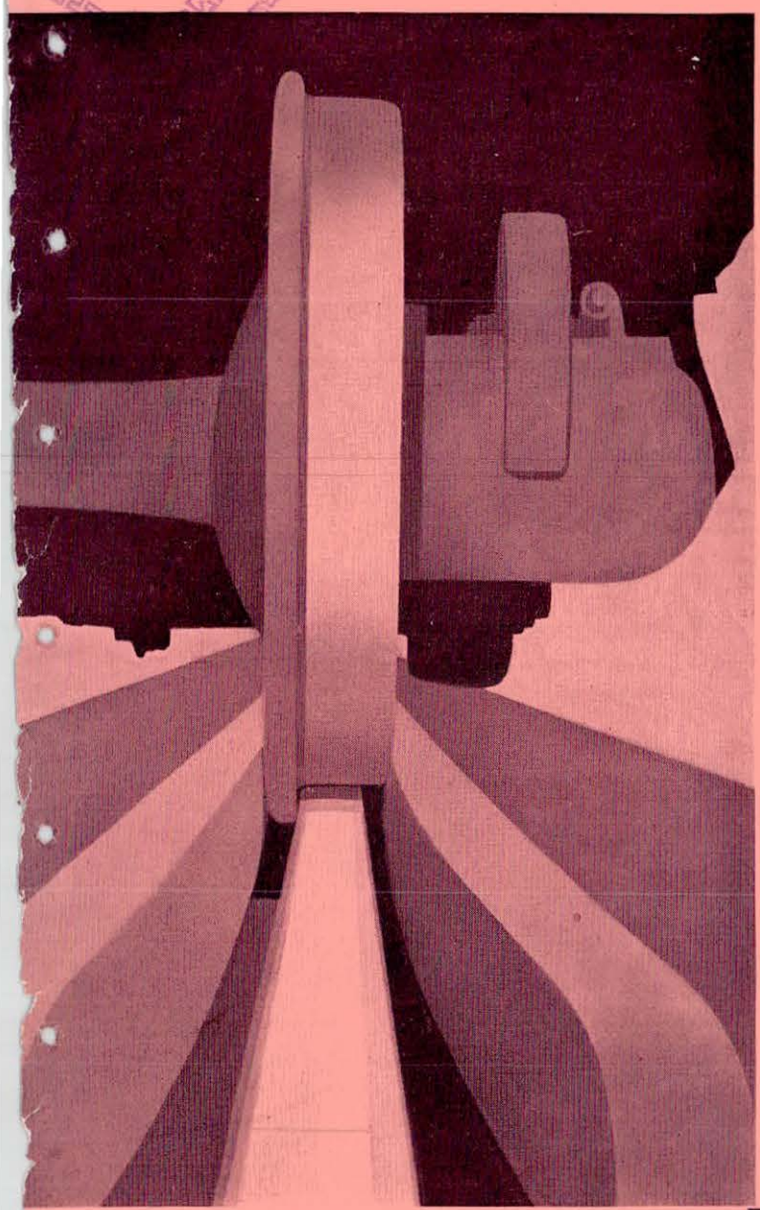


Car Retarders Accomplish Definite Savings In Yard Operation

Article No. 4
Operating Economy Series
See Page 160

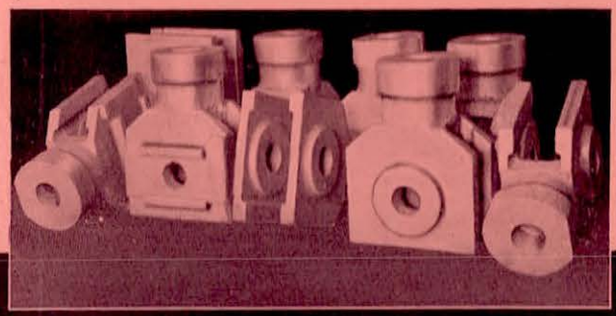
Next Week
Article No. 5

"Centralized Machine Accounting for Better Records, Lower Costs"

This series of articles, which will continue weekly throughout this year, will show what is being done and can be done to secure greater operating economies.

Dependable materials are the best assurance of dependable performance

Right: "Univan" Nickel Alloy Steel Type T locomotive cross-heads.
Below: "Univan" Nickel Alloy Steel locomotive frame cast by the UNION STEEL CASTING CO., Pittsburgh, Pa., for Northern Pacific Railway Company.



UNIVAN....A NICKEL ALLOY STEEL....performs better longer in modern locomotives

● Toughness...impact and fatigue strength...utmost durability under hard service...these properties which Nickel imparts to steel castings are found in "Univan", a Nickel Alloy Steel developed and produced by the Union Steel Casting Co.

"Univan" castings are widely used by the leading railroads of America for such vital locomotive parts as main and side frames, cross-heads, cross-head guides and driving wheel centers. Their dependable performance in heavy duty railroad applications has led to the adoption of "Univan" for the majority of cast steel parts in the famous Timken locomotive, in which the utmost care was given to the selection of all materials.

Our staff of engineers will be glad to advise you in your problems relating to the use of suitable Nickel Alloy Steels.

THE INTERNATIONAL NICKEL COMPANY, INC., 67 WALL STREET, NEW YORK, N. Y.

Miners, refiners and rollers of Nickel...Sole producers of Monel Metal

INCO NICKEL

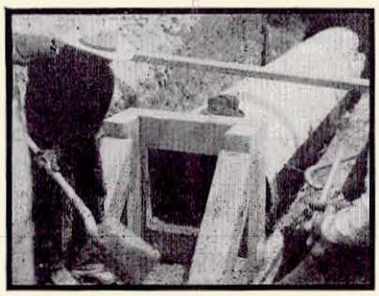
Send for booklet,
"Alloy Steels in the Railroad Field"

Nickel
ALLOY STEEL
PERFORMS BETTER LONGER

Alphabetical Index to Advertisers—Page 56 **Buyers Directory of Advertisers—Page 49**

Published weekly by Simmons-Boardman Publishing Company, 34 North Crystal Street, East Stroudsburg, Pa. Entered as second class matter, March 9, 1928, at the Post Office at East Stroudsburg, Pa., under the act of March 3, 1879.
Address communications to 30 Church St., New York City.

Simply and at Low Cost *Jack* ARMCO Corrugated Pipe through for Conduits



Armco Paved Invert Pipe being installed under a railway in Tennessee by the Armco Jacking Method.

WHEREVER important major openings must be made for drainage or conduits under railroad tracks, both immediate and future economy as well as simplified, labor-saving installation dictates the modern Armco Jacking Method.

The Armco Jacking Method keeps trains moving on schedule, avoids loss of workmen's time and saves from 30 to 50 per cent of installation costs. In no way does this method impair the roadbed. *It works beneath it.*

Another logical and economical step is the use of Armco Corrugated Iron Pipe, the pipe that has an unequaled 25 year record of service in the ground to date. It has been in continuous use under the railroads and highways of America since 1906, weathering every condition of soil, water and pressure.

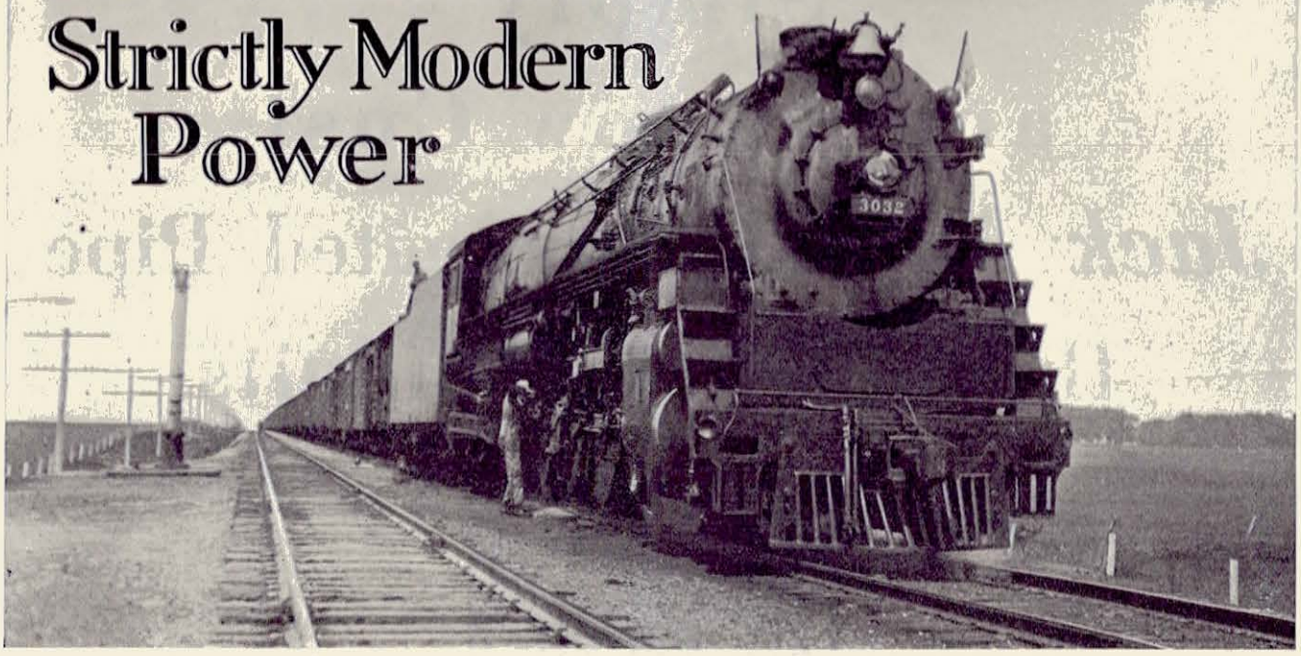
Data and installation information on the Armco Jacking Method will be sent on request.

Armco culverts and drains are manufactured from the Armco Ingot Iron of The American Rolling Mill Company and always bear its brand.

ARMCO CULVERT MANUFACTURERS ASSOCIATION, *Middletown, Ohio*

ARMCO *Jacking Method*

A Profitable Investment-Strictly Modern Power



THE PAST few years have witnessed a remarkable advance in the design and efficiency of all classes of machinery—power plant and material handling equipment, machine tools, ship propelling machinery and all classes of power developing and transforming apparatus.

The steam locomotive is no exception. Although the principles on which it operates have not changed during the past one hundred years, recent advances in design have been so rapid that no locomotive built more than ten years ago can be considered as "strictly modern."

And yet—approximately 80 per cent of the locomotives in service in the United States are over ten years old.

Locomotive modernization offers the most promising field for improvement in railroad operating efficiency. Strictly modern power, wherever installed, has proved a most profitable investment.

THE BALDWIN LOCOMOTIVE WORKS 1831 1931

THE
BALDWIN
LOCOMOTIVE WORKS
PHILADELPHIA

Published every Saturday by the Simmons-Boardman Publishing Company, 34 North Crystal Street, East Stroudsburg, Pa., with executive offices at 30 Church Street, New York

All communications should be addressed to the New York Office 30 Church Street

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Railway Age

With which are incorporated the Railway Review, the Railroad Gazette and the Railway Age-Gazette. Name Registered U. S. Patent Office

Vol. 91 August 1, 1931 No. 5

In This Issue

Car Retarders Accomplish Definite Savings in Yard Operation . . Page 160

Article No. 4 of the Operating Economy Series, which points out how retarders reduce classification costs, expedite train movement, release locomotives and decrease claims.

Special Features Used in New Lift-Span Bridges 164

Unusual cable weight equalizers and one-point control are embodied in two new bridges of this type built by the Pennsylvania over the Hackensack river, near Jersey City, N. J.

Locomotive Designed for Service on the Canadian Prairies 169

A description of the Canadian National sample 2-8-2 type, which has been making good performance records in fast freight and tonnage service in bad water territory.

EDITORIALS

Railway Credit and Economy in Operation 157
Freight Traffic in Two Depressions 158
"Self-Regulation" of Railways and Utilities 159

GENERAL ARTICLES

Car Retarders Accomplish Definite Savings in Yard Operation 160
New Haven Uses Trucks to Speed L.C.L. Delivery 163
Special Features Used in New Lift-Span Bridges 164
N. & W. Yields Ideas in Stores Work 168
Locomotive Designed for Service on the Canadian Prairies 169
Freight Car Loading 172
Problems of the Superintendent, Part IV 173
I. C. C. to Speed Up Rate Hearings 176
Interests of Carriers and Shippers Are Inseparable, by Silas H. Strawn 177
A Safety Lighting Cable for Freight Cars 179
I. C. C. Digs Deeper as Reciprocity Hearings Near Close 181

ODDS AND ENDS 186

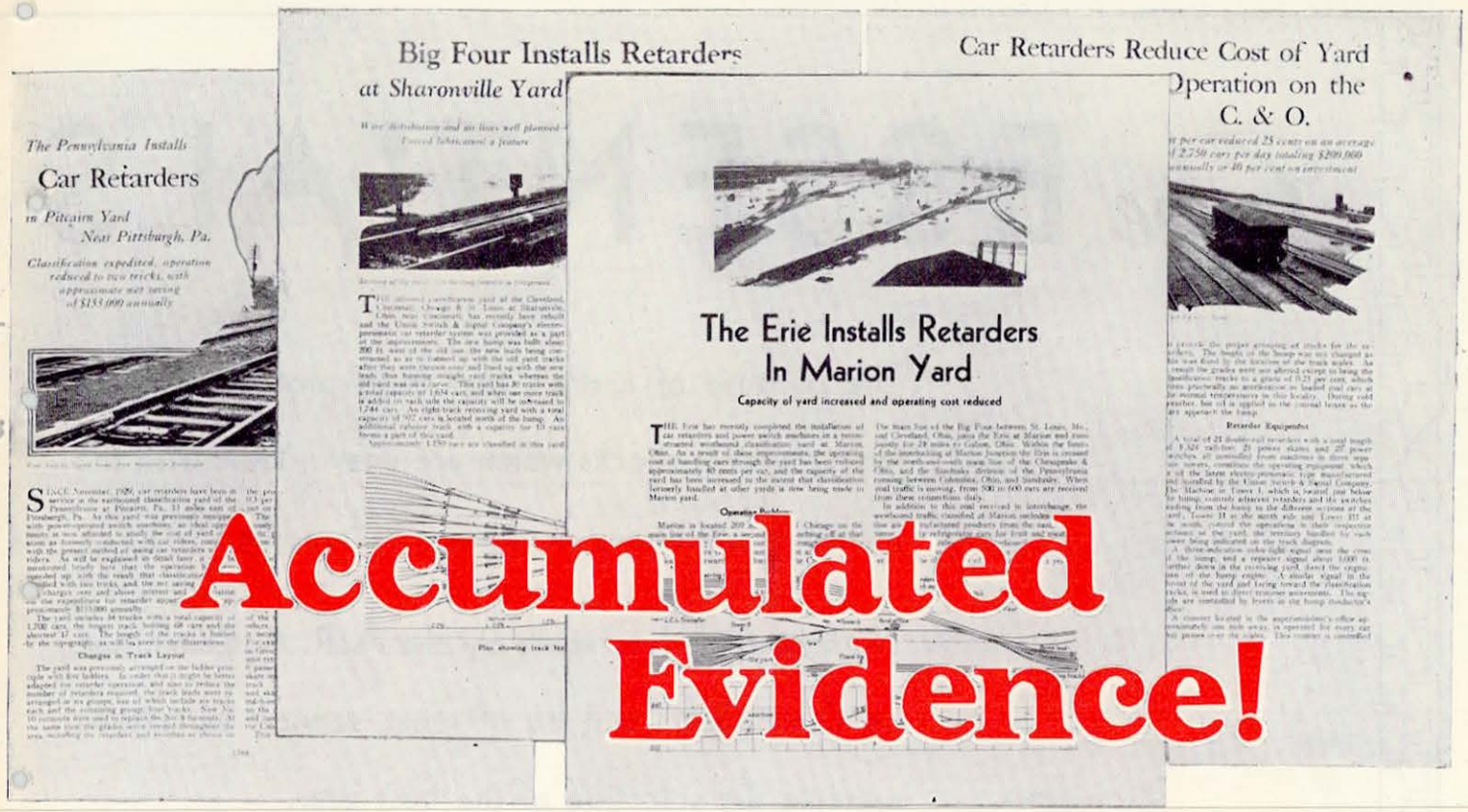
NEWS 187

The Railway Age is indexed by the Industrial Arts Index and also by the Engineering Index Service

Car Retarders on
Modern Yards Complete Solution of B. & M. Terminal Problem
Car Retarders Reduce Cost of Yard Operation on Norfolk & Western
MODEL 28
ELECTRO-PNEUMATIC

District Offices

NEW YORK MONTREAL CHICAGO ST. LOUIS SAN FRANCISCO


The Pennsylvania Installs
Car Retarders
in Pitcairn Yard
Near Pittsburgh, Pa.
Classification expedited, operation reduced to two tricks, with approximate net saving of $153,000 annually
Big Four Installs Retarders
at Sharonville Yard
The Erie Installs Retarders
In Marion Yard
Capacity of yard increased and operating cost reduced
Car Retarders Reduce Cost of Yard
Operation on the
C. & O.

Accumulated Evidence!

DOES accumulated evidence of the savings effected by installation of the "Union" Electro-Pneumatic Car Retarder warrant your attention and consideration? Not a single car retarder installation has failed to more than pay its way. Even in this day of reduced business, car retarders make dollars for their users.

East, West, North, South; from every part of the country figures are obtainable testifying to the large savings effected by the installation of this modern car retarder. Naturally these savings vary in different localities and under differing conditions, but in every instance large savings are recorded in switching service, locomotive repairs, fuel, hostler expenses, car inspection and repair, per diem charges and other operating accounts. "Union" Electro-Pneumatic Car Retarders enable maintaining a smooth and continuous movement of cars through a terminal or yard; shipments are speeded up tremendously; accidents and damage to equipment are materially reduced; labor costs are minimized; yard operation is facilitated; savings ranging from 25 to 50 percent on the investment for new equipment are being made. Car retarder installations pay for themselves in from one to four years. The accumulated evidence proves this conclusively.

When considering these facts, in addition to the ability to facilitate traffic, it is no wonder that the application of "Union" Electro-Pneumatic Car Retarders is being so generally adopted. Let our nearest district office furnish you more information.

1881 **Union Switch & Signal Co.** 1931

SWISSVALE, PA.

The ESSENTIALS

The purpose of a draft gear is to protect cars and lading against shocks which are unavoidable with the intensive conditions of modern railroading.

The impartial tests made by the A. R. A. Committee on Draft Gears will be of great service in guiding users to the selection of the best gear.

Many technical problems are involved in the selection of the most efficient draft gear, but the basic principals are simple.

1. . . . *Capacity:*

The essential function of a draft gear is to cushion the blow between colliding cars. The higher the capacity of the gear, the greater the blow that can be cushioned without excessive shock to the car and lading.

The EDGEWATER Draft Gear has a capacity greater than any other gear which fits into the Standard A.R.A. gear pocket.

2. . . *Endurance:*

The endurance of a draft gear measures its ability to stand up under hard service and to continue to provide cushioning capacity.

The lubricated friction surfaces of the EDGEWATER gear ensure a long life with a minimum loss of capacity in service.

of the DRAFT GEAR

3. *Smooth Action:* It is important that a draft gear shall close smoothly under impact. The jerky action, which is common in dry friction gears subjects cars and lading to shocks out of all proportion to the blows.

The EDGEWATER gear, because of its lubricated friction surfaces, closes smoothly whether the impact takes place at high speeds or at low.

4. . . *Uniformity:* It is obviously desirable that all draft gears purchased for a given service shall be uniform in capacity and performance. The accurately rolled and thoroughly lubricated friction surfaces of the EDGEWATER gear ensure a much higher degree of uniformity than is obtainable with a dry friction gear.

5. . . . *Release:* In order to provide for constant protection, a draft gear should release quickly and positively after impact.

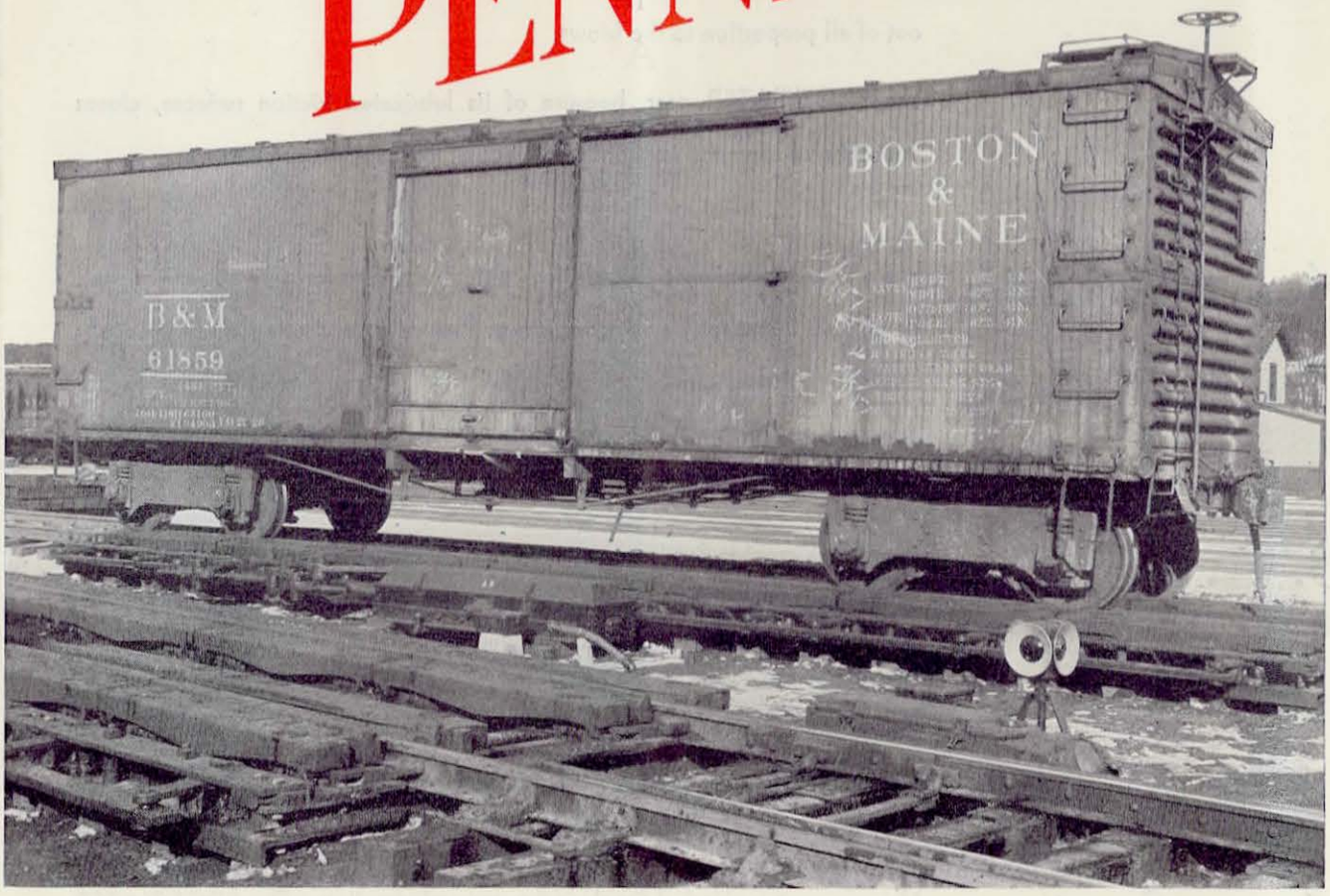
The ring spring action of the EDGEWATER gear provides for efficient release, without injurious recoil action. The friction of the EDGEWATER ring spring damps out vibration and prevents destructive surges.

6. . . *Simplicity:* No argument is needed for the advantage of simplicity. The EDGEWATER gear achieves the greatest simplicity possible. It is furnished as a single self-contained unit. No replacements or attention are required during the life of the gear and no spare parts need be carried in stock.

EDGEWATER STEEL COMPANY · PITTSBURGH

Sales Offices: ATLANTA BALTIMORE BOSTON CHICAGO LOUISVILLE NEW YORK
PHILADELPHIA PORTLAND SAN FRANCISCO ST. LOUIS ST. PAUL SEATTLE WASHINGTON

SQUEEZE YOUR PENNIES



30,000 TO 100,000 PENNIES ARE ROLLING AWAY EACH DAY THAT YOUR CLASSIFICATION YARD IS OPERATED WITHOUT

CAR RETARDERS

GENERAL RAILWAY

ROCHESTER, New York

Affiliated Companies' Offices: Chicago Montreal London Paris

30 TO 60 CENTS PER CAR have been saved in classification yards wherein **G.R.S. TYPE "B" ALL-ELECTRIC CAR RETARDERS** have achieved prominence.

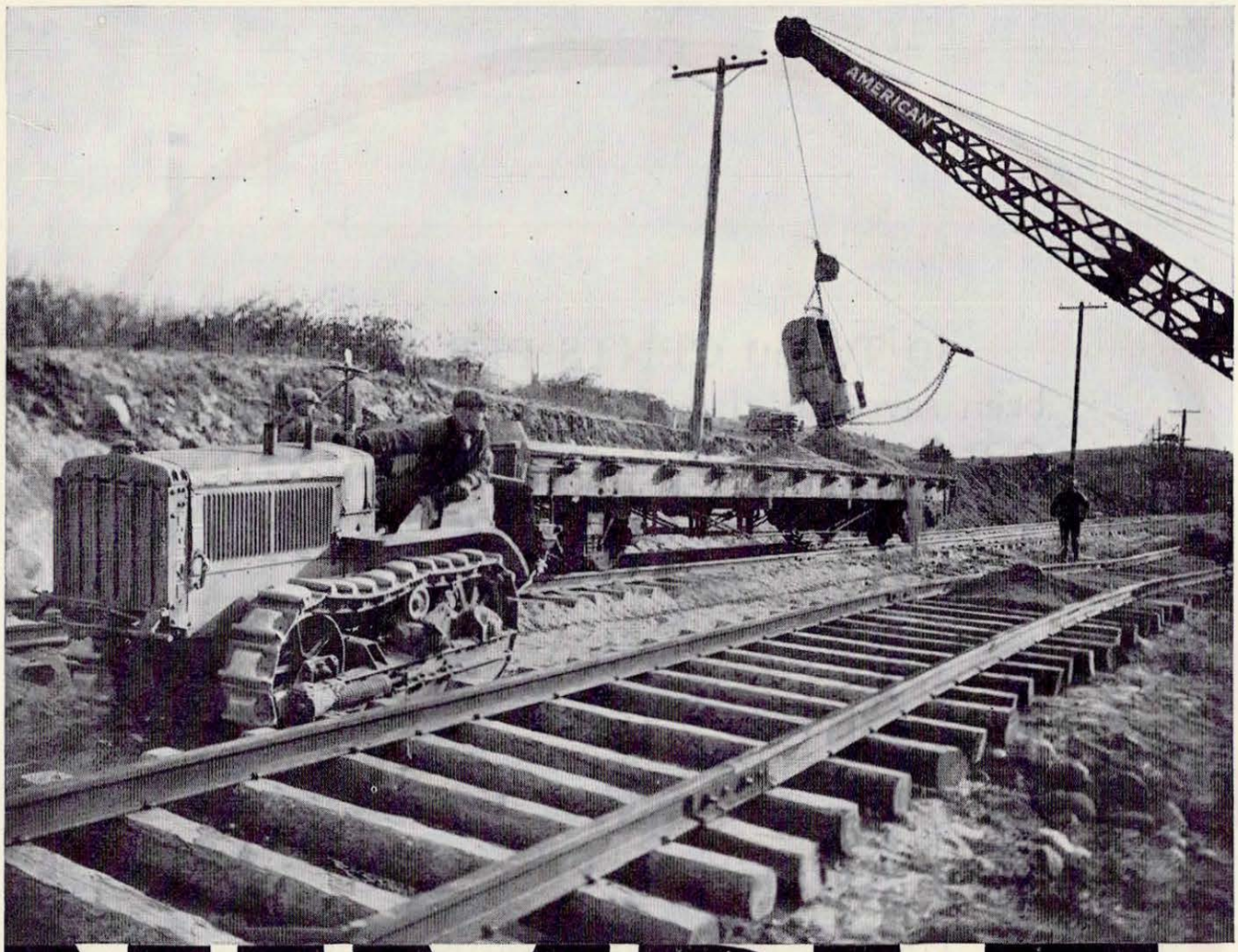
The All-Electric Car Retarder is one more step in the Progress of Railroad and Industrial Electrification, and again demonstrates the fact that electricity offers the most reliable, efficient, and economical of operating methods. Energy is used only in proportion to the work done.

The Type "B" Car Retarder is designed mechanically rugged and is manufactured from the best materials obtainable; thereby insuring a long and serviceable life. The assembly is so simplified that a small personnel can handle its maintenance, while tamping facilities are such that track maintenance is minimized.

SIGNAL COMPANY

NEW YORK
York St. Louis
Tokyo Barcelona Melbourne Calcutta Buenos Aires

A-849



NIMBLE, TOO

"CATERPILLAR" track-type Tractors are generally credited with ample power and amazing traction. Add nimbleness! Across the rails they ride when there are cars to be spotted. They turn in narrow corners. They push or pull. Mud doesn't stop them, nor sand. Here's a Twenty doing one of many chores where new trackage is being laid at the P. G. Speakes Co. sand and gravel pit at Hopkins, Minnesota. Power, traction — and nimbleness!

CATERPILLAR

REG. U. S. PAT. OFF.

TRACTOR

Prices — f. o. b. Peoria, Illinois

TEN	$1100	TWENTY . .	$1900
FIFTEEN . .	$1450	THIRTY .	$2375
SIXTY . . .	$4175		

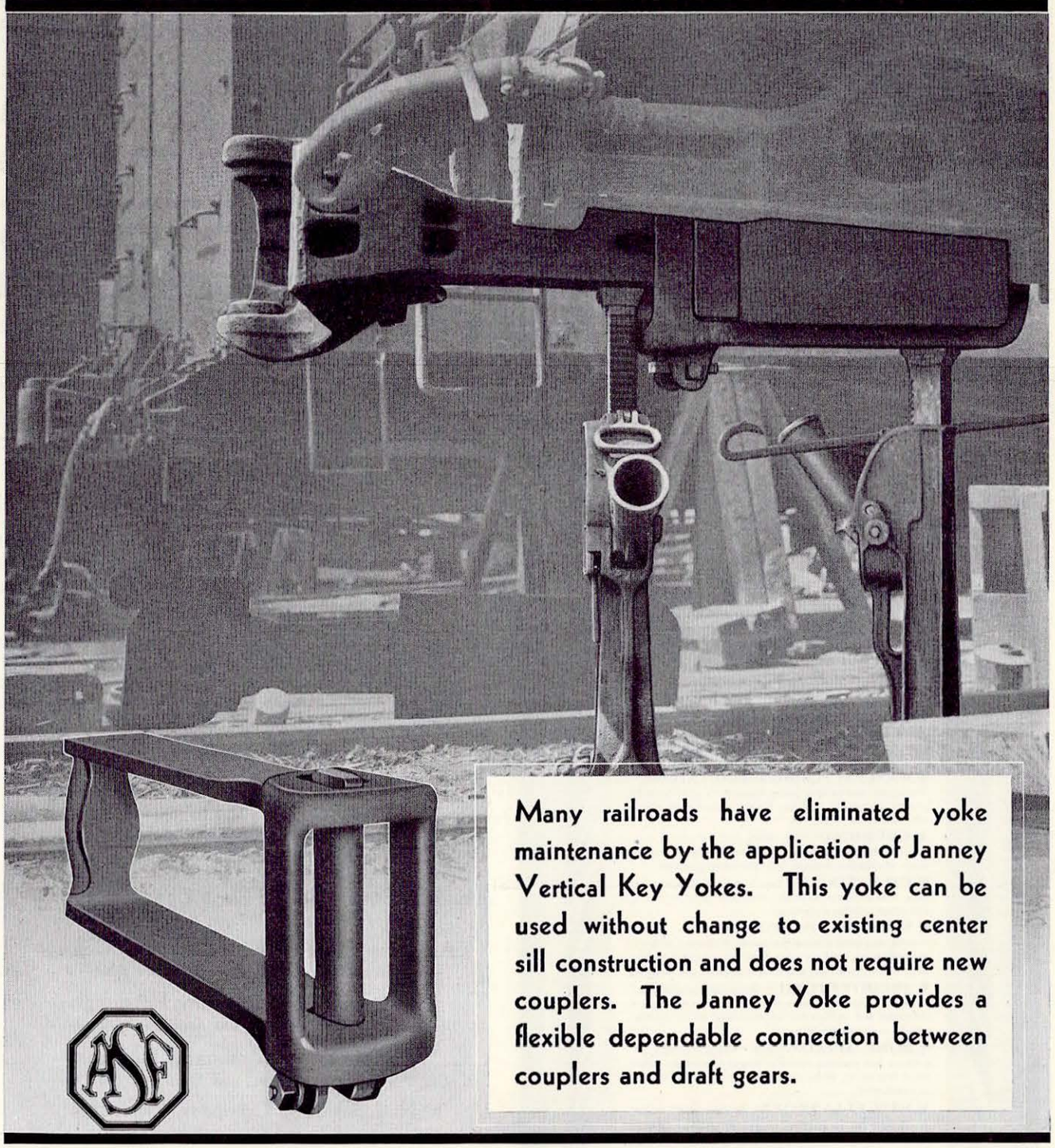
Caterpillar Tractor Co.

PEORIA, ILLINOIS, U. S. A.

Track-type Tractors Combines Road Machinery

(There's a "Caterpillar" Dealer Near You)

Eliminate YOKE MAINTENANCE

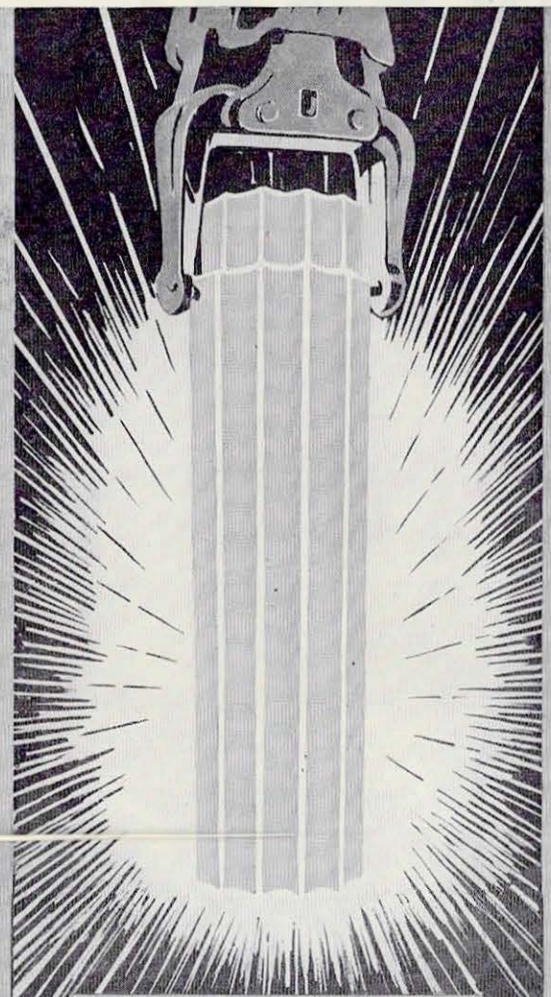


Many railroads have eliminated yoke maintenance by the application of Janney Vertical Key Yokes. This yoke can be used without change to existing center sill construction and does not require new couplers. The Janney Yoke provides a flexible dependable connection between couplers and draft gears.

AMERICAN STEEL FOUNDRIES

NEW YORK CHICAGO ST. LOUIS

FOR THE MOST EXACTING USES



Typical Uses:

¶ **AUTOMOTIVE and AERONAUTIC**—For radiator shells, hub caps, lamps, bumpers, moldings, polished parts and fittings, hardware and trim, airplane parts and instruments.

¶ **MANUFACTURING and INDUSTRIAL**—Machinery and furnace parts, dampers, fans, preheaters, pumps, conveyors, turbine blades, nozzles, plungers, and machinery specialties.

¶ **CHEMICAL**—Vats, tanks, stills, digesters, condensers, retorts, paper and pulp manufacturing equipment, circulation systems, and laboratory apparatus.

¶ **OIL REFINING**—Bubble caps, still tubes, linings, heat exchangers, ducts, containers, tanks, agitators, and other refining equipment.

¶ **FOOD HANDLING**—Pasteurizers, tables, hospital and hotel kitchen equipment, restaurant fixtures, cafeteria trays, food preserving and dairy machinery and accessories, ice cream and milk containers and utensils.

¶ **ARCHITECTURAL**—Structural members and supports, hinges and hardware, decorative metal embellishments, flat surface facings, moldings, doors, grilles, panels, and ornamental work.

¶ **HOME APPLIANCES**—Kitchen equipment cooking and canning utensil's, furniture, cabinets, electrical appliances, sinks, plumbing fittings, stoves, ranges, and tableware.

¶ **MISCELLANEOUS**—Packing house equipment, soda fountain counters and fixtures, display cases, humidors, handles, hooks, trays, golf clubs, skates, switch boards, metallic mirrors, laundry machinery, tank cars, railway car parts and fittings, and many other uses where beauty and resistance to corrosion are important factors.

Chromium-Alloy Steels *Ferritic*

USS 12
USS 17
USS 27

USS

Chromium-Nickel Steels *Austenitic*

USS 18-8
USS 18-12
USS 25-12

STAINLESS AND HEAT RESISTING ALLOY STEELS

FOR all applications in which appearance and beauty, effective resistance to corrosion, and unusual physical properties are important considerations, the alloy steels of the U S S series are furnishing an answer to the question, *what metal is adaptable?*

In your living room and kitchen, favorite hotel and restaurant, bank vault and office building, on your automobile, and even in your pockets, you may encounter articles with essential parts made of U S S Stainless Steels.

Industries ministering to your needs use this remarkable alloy steel in their products and processes. Artistic as well as utilitarian, the U S S Stainless Steels find manifold applications. Write for full information to the subsidiary companies of the United States Steel Corporation listed below.

U S S Chromium-Nickel Alloy Steels are produced under licenses of the Chemical Foundation, Inc., New York; and Fried. Krupp A. G. of Germany.

U·S STEEL

American Sheet and Tin Plate Company, Pittsburgh
Sheets and Light Plates

American Steel & Wire Company, Chicago
Cold Rolled Strip Steel, Wire and Wire Products

Carnegie Steel Company, Pittsburgh
Bars, Plates, Shapes, Special and Semi-Finished Products

Illinois Steel Company, Chicago
Bars, Plates, Shapes, Special and Semi-Finished Products

National Tube Company, Pittsburgh
Pipe and Tubular Products

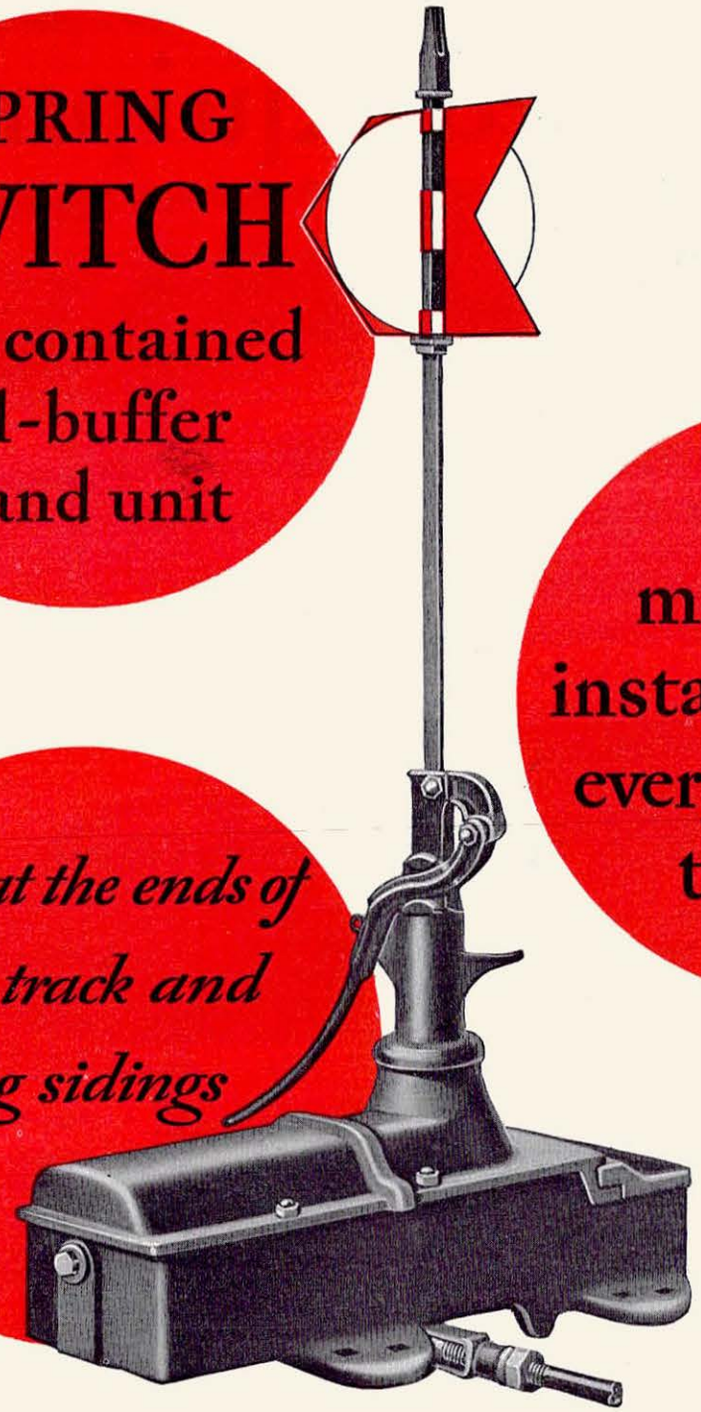
Pacific Coast Distributors: COLUMBIA STEEL COMPANY, San Francisco
Export Distributors: U. S. STEEL PRODUCTS COMPANY, New York City

SPRING SWITCH

self-contained oil-buffer stand unit

Saves more than installation cost every month of the year

used at the ends of double track and passing sidings



3-IN-1 SWITCH STAND STYLE NO. 100-A

After severe tests at such locations, many of the leading roads have now adopted the 3-in-1 switch stand as standard. None of the claims we have made for this stand were disproved during these tests. The 3-in-1 was especially designed for use at the ends of double track and passing siding. Its three features, all combined in one compact housing, are:

1. A rigid-throw always ready for hand operation.
2. Two automatic double-coil springs returning points after trailing train has passed.
3. An oil-buffer preventing return of points between successive pairs of wheels.

This is the first switch stand to combine all these features in one compact housing; in throwing it *cannot* be closed and locked when an object intervenes between the points and the stock rail. Many locations on your railroad need this switch stand. Write today for complete printed information about the 3-in-1.

RAMAPO AJAX CORPORATION

Racor Pacific Frog and Switch Company . . . . . Los Angeles—Seattle
Canadian Ramapo Iron Works, Limited . . . . . Niagara Falls, Ontario

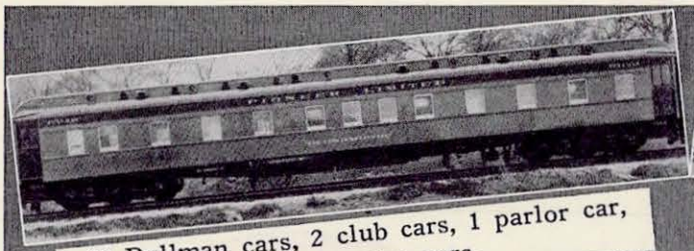
General Offices—230 Park Avenue, New York

Sales Offices at Works and McCormick Bldg., Chicago Midland Bank Bldg., Cleveland, Ohio Builders Exchange Bldg., St. Paul Metropolitan Bank Building, Washington Union National Bank Building, Houston, Texas

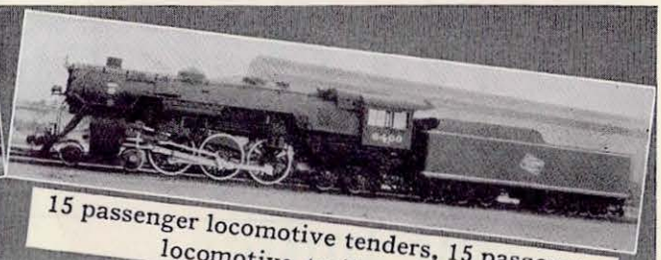
Nine Racor Works: Hillburn, N. Y. Niagara Falls, N. Y. Chicago, Ill. East St. Louis, Ill. Superior, Wis. Pueblo, Col. Los Angeles, Cal. Seattle, Wash. Niagara Falls, Ont.

RACOR

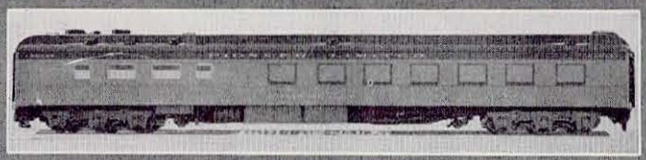
Timkenized equipment



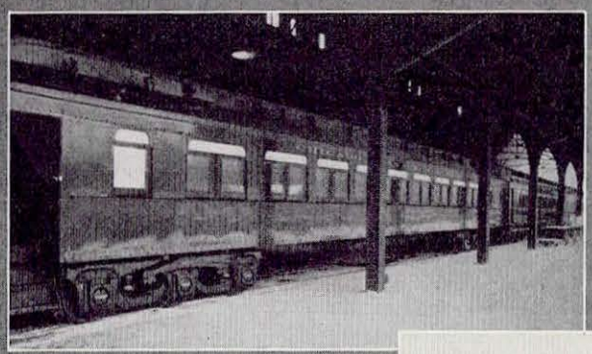
70 Pullman cars, 2 club cars, 1 parlor car, 2 observation cars.



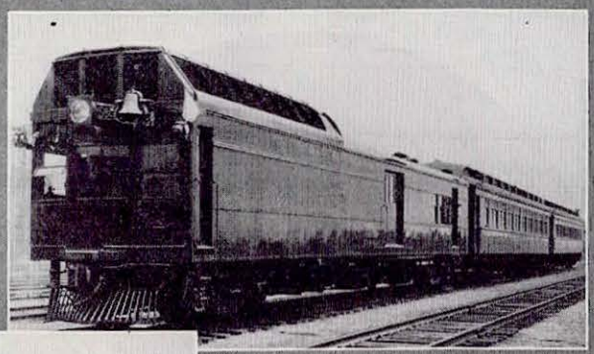
15 passenger locomotive tenders, 15 passenger locomotive trailer trucks.



16 dining cars and 2 buffet cars.

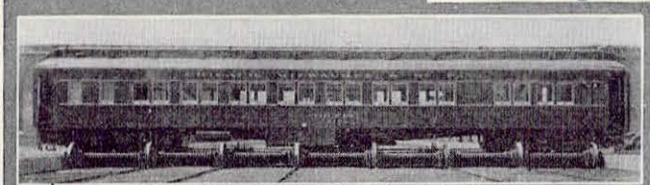


20 day coaches.

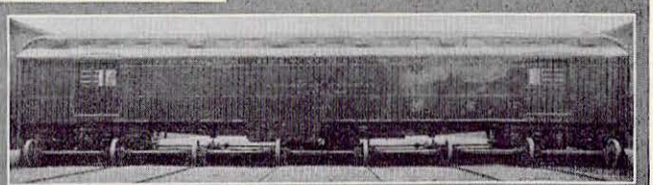


2 steam locomotor cars.

15 gas-electric units, 2 oil-electric switching units as shown above.



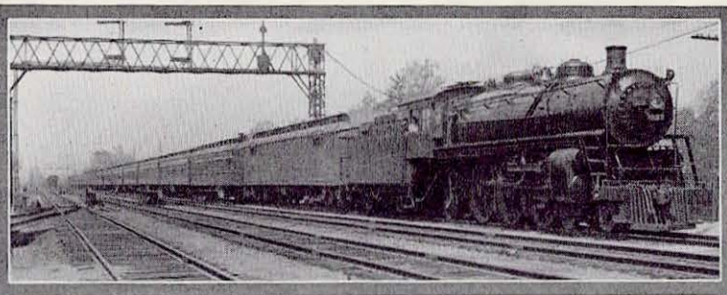
9 tourist sleeping cars.



28 mail, express and baggage cars.

TIMKEN *Tapered Roller*

on the Milwaukee Road

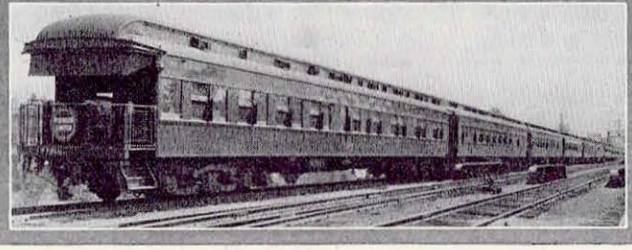


Timken-equipped "Olympian" train arriving in Chicago from the Pacific Coast. There are 8 of these trains in service.

The Chicago, Milwaukee, St. Paul & Pacific was one of the first railroads to see the advantages of Timken Bearings and apply them to its rolling stock. The Timkenized units now in service on this road are expressive of the satisfaction which Timken Bearings have given.

For freedom from hot boxes, for reliability, for faster schedules with heavier trains, for greater riding comfort, for lubrication economies and lower maintenance cost you need Timken Bearing Equipped cars and locomotives.

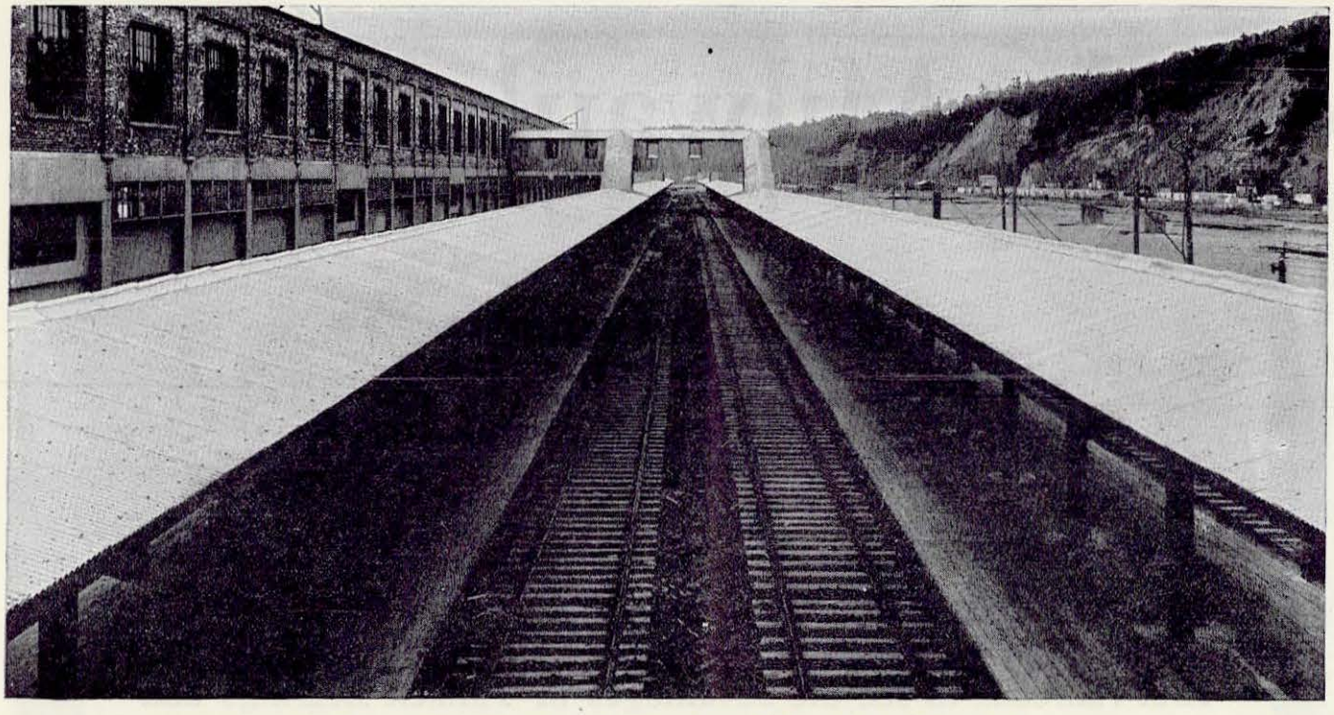
THE TIMKEN ROLLER BEARING COMPANY, CANTON, OHIO



"Pioneer Limited" first completely roller bearing equipped Pullman train in the history of American railroads.

Tapered Roller
TIMKEN BEARING
EQUIPPED

BEARINGS



The Wolfe's Cove Terminal of the Canadian-Pacific Railway, Quebec, P. Q., Canada.
General Contractor, Jos. Nolin, Quebec, P. Q.

OVER 85,000 SQUARE FEET OF *Careystone Corrugated* for Wolfe's Cove Terminal

When the Canadian-Pacific's new liner, The Empress of Britain, docks at her home port, she meets the rails at the Wolfe's Cove Terminal. The huge train sheds shown above are roofed with over 85,000 square feet of Careystone Corrugated, the modern, permanent roofing and siding.

Careystone Corrugated is made of asbestos fibre and Portland cement combined by ingenious machinery which distributes the fibre uniformly throughout the sheet. This exclusive Carey process produces great initial strength which increases with age instead of decreasing.

There are excellent reasons why Careystone Corrugated is now widely used in all types of construction, from small industrial buildings to huge terminals. First, it contains nothing to rust, rot or burn and resists trying exposure conditions, such as dampness, locomotive gases, fumes, etc. Second, Careystone Corrugated never requires paint or other treatment to preserve its surface; it is as lasting as stone. Third, Careystone Corrugated comes to the job factory-cut to size, and therefore the time and labor required for erection are reduced to the minimum. Finally, its first cost is frequently lower than that of materials which are far less permanent.

It will pay you to get full information about Careystone Corrugated in connection with any contemplated construction. Our engineering department will supply, without obligation, sketches and estimates for any type building.

THE PHILIP CAREY COMPANY :: Lockland, Cincinnati, Ohio

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BUILT-UP ROOFS
ASPHALT PRODUCTS
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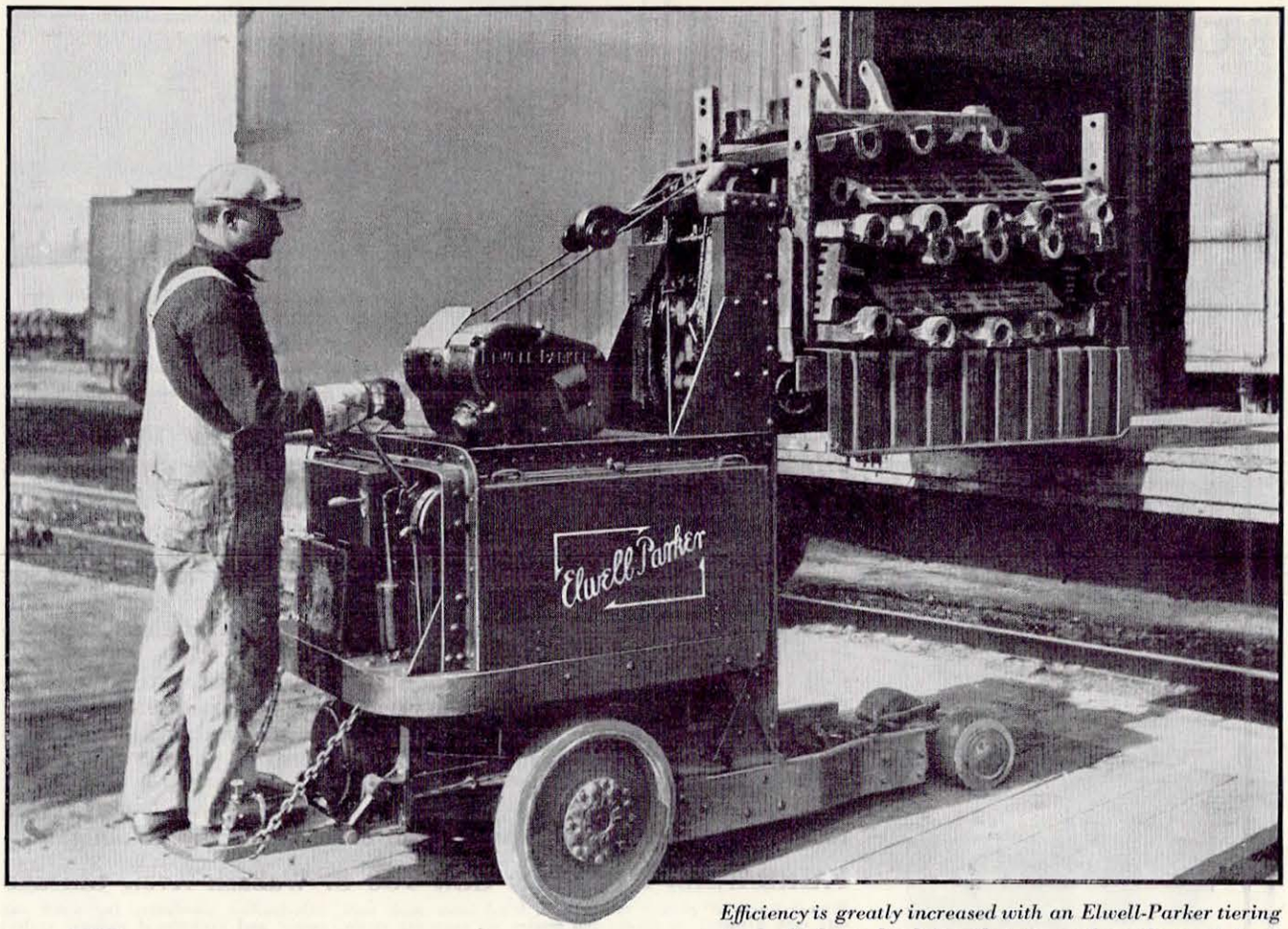
HEAT INSULATIONS
ASBESTOS MATERIALS
CAREYSTONE CORRUGATED SIDING
ASFALTSLATE SHINGLES
BUILDING PAPERS

553

Freight House Efficiency *is judged by its mechanical* Handling Equipment



Efficiency is greatly increased with an Elwell-Parker tiering truck which can load directly into car from the track level.

THE largest users of railroad freight service are the industrial operators who know the value of materials handling equipment because *they are using it on thousands of industrial handling jobs.*

Traffic managers who route railroad traffic appreciate the importance of mechanical handling. They are the judges of *your* freight handling facilities. Can you show them modern, electric trucking methods in your freight terminals?

Elwell-Parker Electrics handle *bigger loads—faster.* They *shorten* the waiting motor truck time, *reduce accidents* to workmen, *reduce damage claims, increase the profit* in freight handling. They're visible, active proof of the efficiency of your freight moving operations. Their effect upon the industrial traffic manager may influence his routing of shipments.

For proof of the advantages Elwell-Parkers give you, with actual figures applying to your own operations, let an Elwell-Parker Field Engineer survey your operations. Together with the figures, he will show you drawings and specifications of the types and sizes of Elwell-Parkers best suited for your needs.

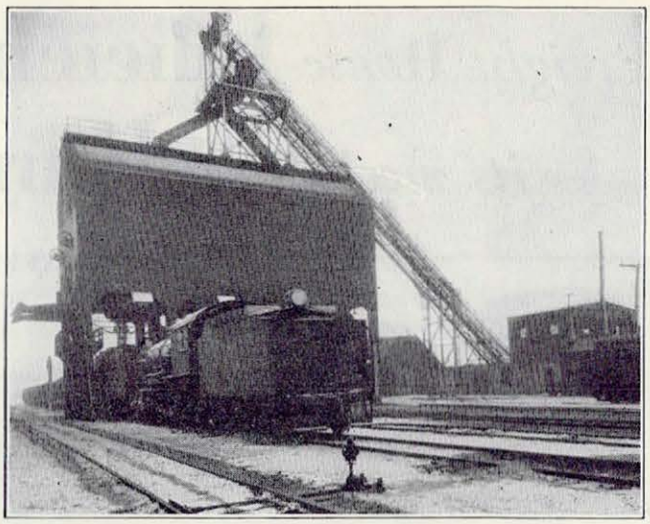
Then you will have the complete proposition, without cost or obligation to you. Phone the nearest Elwell-Parker office—or write to Elwell-Parker, 4250 St. Clair Avenue, Cleveland, Ohio.

"Handling Freight at Lower Cost" is a new Elwell-Parker Bulletin that will be off the press in a few days; a complete, pictorial discussion of cost-cutting ways of handling. Write now, asking that a copy be reserved for you.

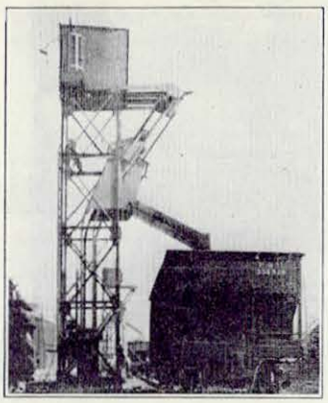
ELWELL-PARKER

DESIGNERS AND BUILDERS OF ELECTRIC INDUSTRIAL TRUCKS, TRACTORS AND CRANES FOR OVER A QUARTER CENTURY

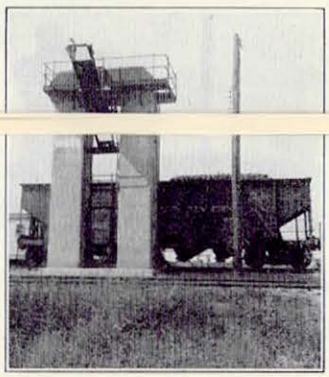
Modern F-M equipment cuts locomotive servicing costs



2,000-ton coaling station for the Erie Railroad at East Buffalo, New York is equipped with Fairbanks-Morse duplicate units, full automatic, electrically-controlled skip hoists, handling 150 tons of coal to the hour. Installed in 1930.



Single or multiple track cinder conveyor with 4-post tower and apron.



One of twenty-six full automatic conveyor type coalers built in the last two years.

Coal, sand, water and decindering plants for every requirement . . . Savings pay for installation in short time . . .

Fairbanks-Morse, with an experience of more than 30 years in designing and building locomotive servicing machinery, offers railroads a complete line of coal, sand, water and decindering equipment to meet every requirement from the largest terminal to the smallest outlying station.

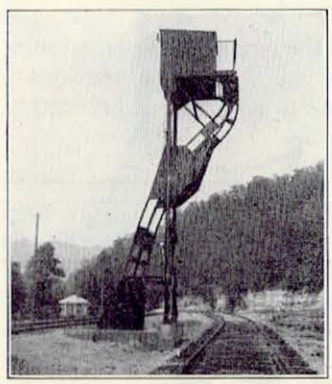
F-M full automatic coal and sand handling equipment with either continuous conveyor or skip hoist-type machinery, designed and perfected by Fairbanks-Morse, is showing substantial economies in hundreds of plants. Actual savings in operation, sufficient to pay for the equipment in short time, are being made by these plants.

Get the facts *now*—when every saving in operating costs counts more than ever before! Your request for information carries no obligation.

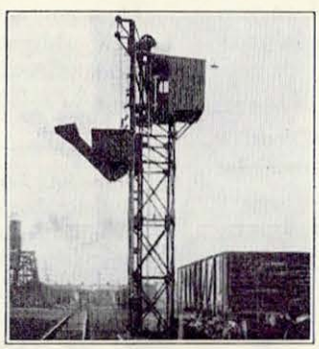
FAIRBANKS, MORSE & CO., 900 S. Wabash Ave., Chicago

Manufacturers of railway motor cars, hand cars; push cars; velocipedes; standpipes for water and oil; tank fixtures; stationary and marine oil engines; steam, power and centrifugal pumps; scales; motors and generators; complete coal, sand and cinder handling and storage facilities.

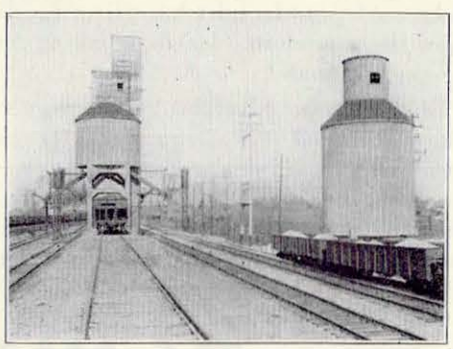
FAIRBANKS-MORSE *coaling stations*



Single or multiple track cinder conveyor with skip hoist. Tower without apron.



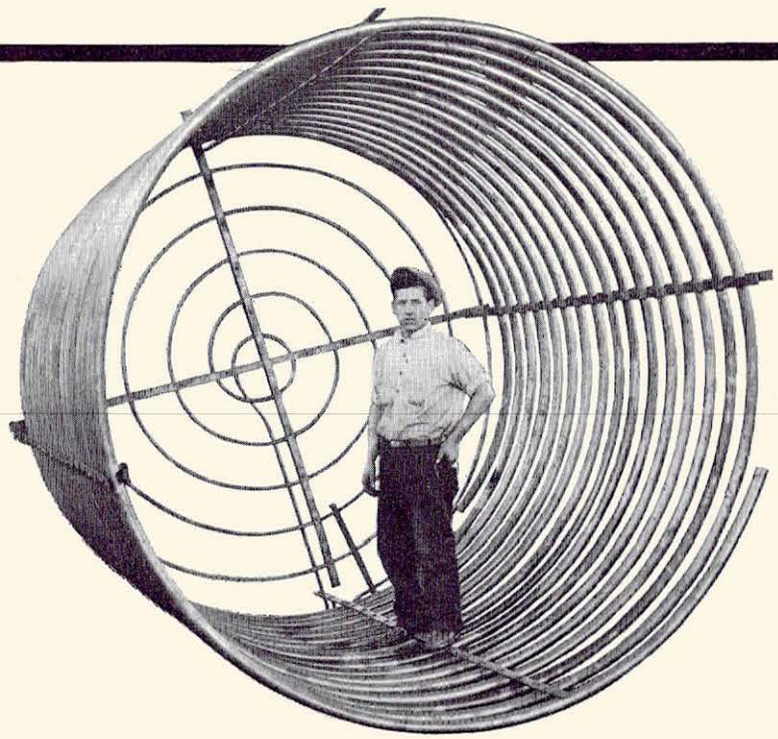
Full automatic skip hoist coaler



770-ton sand station with automatic skip hoist installed for the Chesapeake & Ohio Railroad at Columbus, Ohio.

5556-RA 21.81

Railroad men everywhere are welcoming BYERS WROUGHT-IRON BENDING PIPE . . .

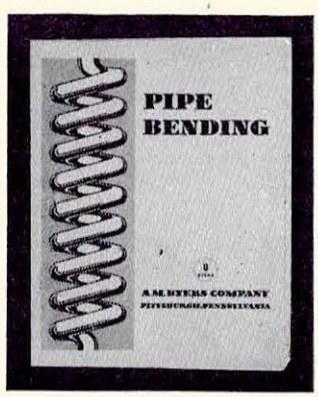


In the few months since its introduction, Byers Bending Pipe has made quite a name for itself in the large railroad shops of the country. Its superior resistance to corrosion and vibration-fracture, plus its exceptional bending qualities, have filled a long-felt need for a more adaptable pipe for installations requiring difficult hand or machine bending.

For instance, one railroad pipe-shop foreman reports cold bending the extra-heavy bending pipe to center-to-center diameters as low as 3.3 times the outside diameter with excellent results. Other shops are daily reporting equally favorable results. And all the advantages of regular Byers Pipe, so familiar to railroad men, have been retained.

Byers Genuine Wrought Iron Bending Pipe will save you time and money. It will speed up your close-bend production schedules. It will minimize installation troubles. It will reduce the number of failures during fabrication. In short, Byers Bending Pipe takes the "grief" out of railroad pipe-bending. Write for further information, and for our interesting Bulletin No. 50, "Pipe Bending." A. M. Byers Company, Pittsburgh, Penna. Established 1864.

SEND FOR A COPY

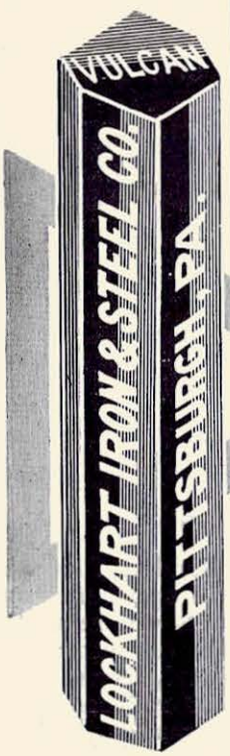


BYERS GENUINE WROUGHT IRON BENDING PIPE

AN INVESTMENT—NOT AN OUTLAY

VULCAN XX

Engine bolt iron



There is no substitute for the wrought iron dependability of VULCAN XX ENGINE BOLT IRON. It gives to hard-working locomotives the toughest sinews of strength—far superior to the brittle crystalline structure of steel bolts.

For VULCAN XX ENGINE BOLT IRON has the characteristic built-up structure of wrought iron, composed of layer on layer of beaten iron, welded into a solid homogeneous unit of super-strength.

For this reason VULCAN XX ENGINE BOLTS can't shear in the most severe service as steel bolts do. Every layer of iron acts as a perfect barrier to progressive segregation.

That's why so many railroads use VULCAN XX ENGINE BOLT IRON. They last for years.

VULCAN BLOOM STAYBOLT IRON
VULCAN IRON FORGING BILLETS

Lockhart Iron & Steel Company
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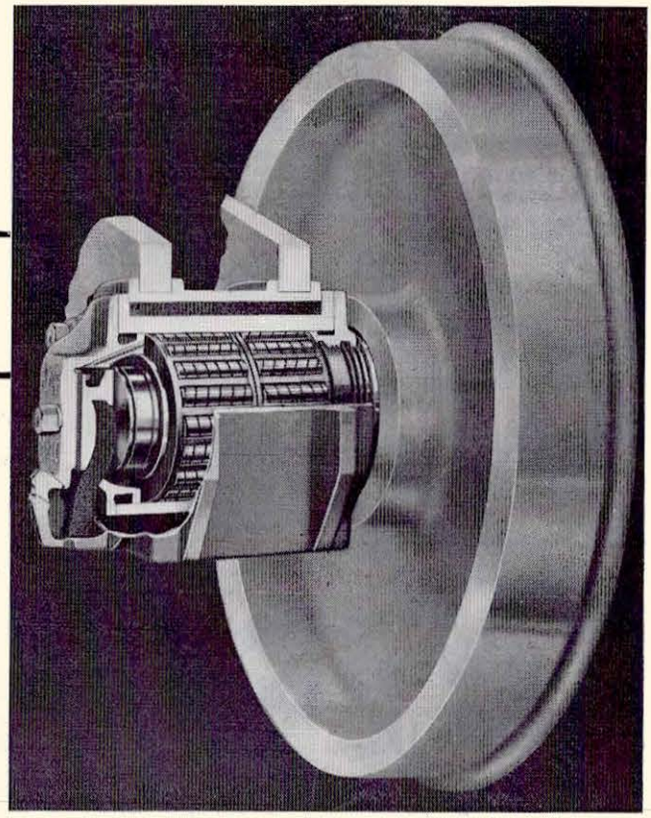
Direct Mill Representatives:
Blatchford Corporation
Railway Exchange,
Chicago, Ill.

LOCKHART
PITTSBURGH

CUSHIONED··

to minimize noise and vibration



THERE is a restful absence of noise when gliding smoothly along on Fafnir-Melcher Roller Journal Bearings. Din and clatter arising from the inevitable continuous pounding on the wheels is absorbed by a non-metallic pad which lies within the journal between the equalizer and the bearing.

Bearing life is lengthened because shocks are effectively cushioned by this pad. Vibration is practically banished. And actual service on some of America's leading railroads has proven that these benefits are not temporary. They are enjoyed continuously for the life of the bearing.

There are many other features such as the integral outer race and filtered lubrication, which contribute to the low cost that characterizes Fafnir-Melcher Roller Journal Bearings. Have one of our Railway Specialists give you complete data.

Every requirement fulfilled!

1. *Ample capacity to carry all loads without heating.*
2. *Positive lubrication at all speeds and temperatures.*
3. *Lateral adjustment possible when made necessary by truck wear or distortion.*
4. *Insulation from shocks and deadening of noise.*
5. *Interchangeability with A. R. A. equipment.*
6. *Simplicity of installation and maintenance.*

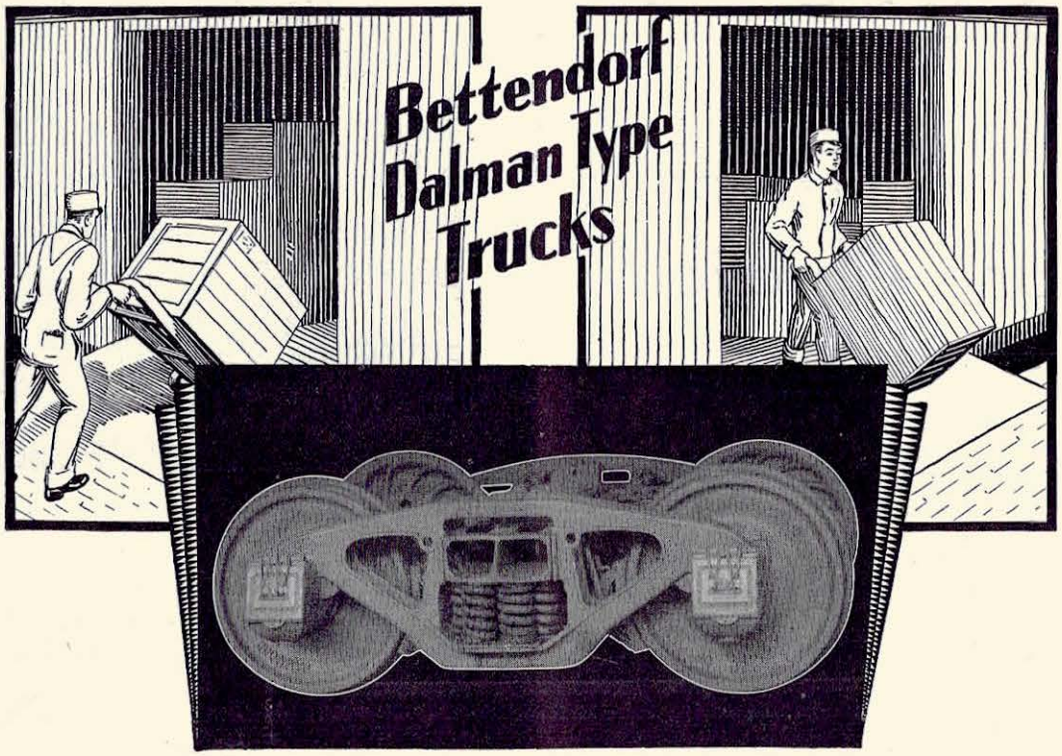
FAFNIR BEARINGS INCORPORATED

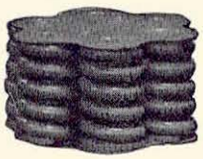
General Sales Office and Factory—New Britain, Conn.

Western Service Div.—39 S. Clinton St., Chicago, Ill.

FAFNIR-MELCHER Roller Bearings for Car Journals

Maine To California . . .
Easy Riding Dalman Trucks Protect the Freight and Save the Car





The Dalman spring group which gives Bettendorf-Dalman Type Trucks ample reserve spring capacity and unusual shock absorbing ability, can now be furnished in a single cluster as illustrated above if desired.

The Dalman Feature Adds Two Standard Coils To Each Spring Group.

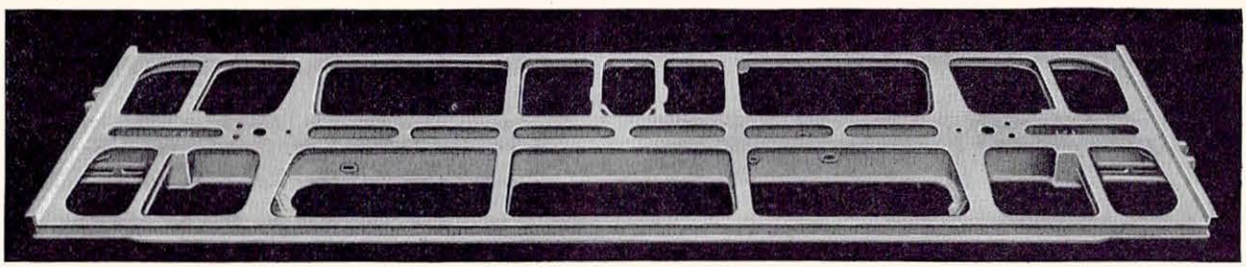
SAFELY aboard in Maine and safely off in California. True of valuable and fragile freight as well as sturdy machinery. The Bettendorf Dalman-Type Truck has set at naught the countless potential road shocks that are the constant enemy of freight and car alike.

The road shocks are still there, but they cannot drive home with sickening and costly impact. They are smothered and disciplined within the ample Dalman spring group with its ability to withstand even the more severe of the thumps ever present along the steel highways of trade. Is it any wonder that the more exacting specifications read "Trucks—Bettendorf Dalman Type".

THE BETTENDORF COMPANY

OFFICES AND WORKS BETTENDORF, IOWA

Commonwealth
CABOOSE CAR UNDERFRAME



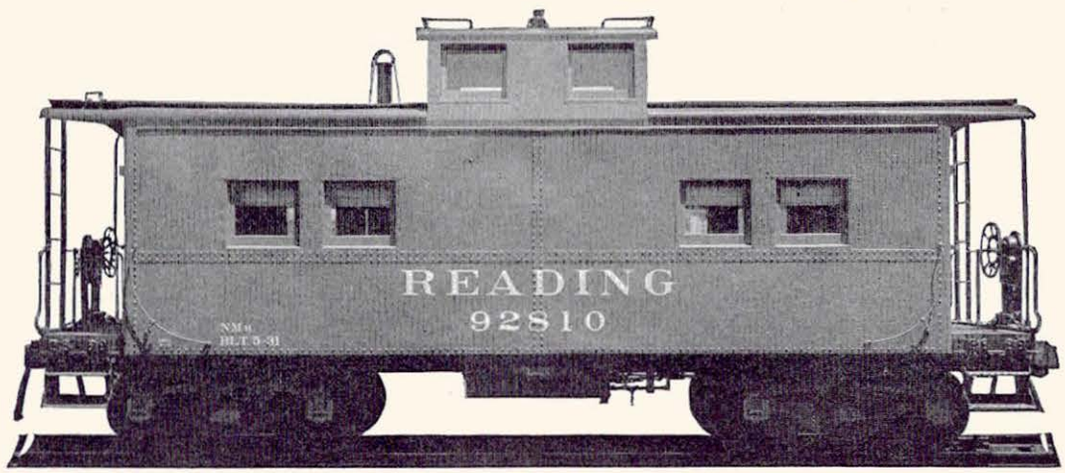
Integral Cast Steel Construction

Provides Maximum Strength

Eliminates Costly Maintenance

Insures Safety When Pusher Locomotive is Used

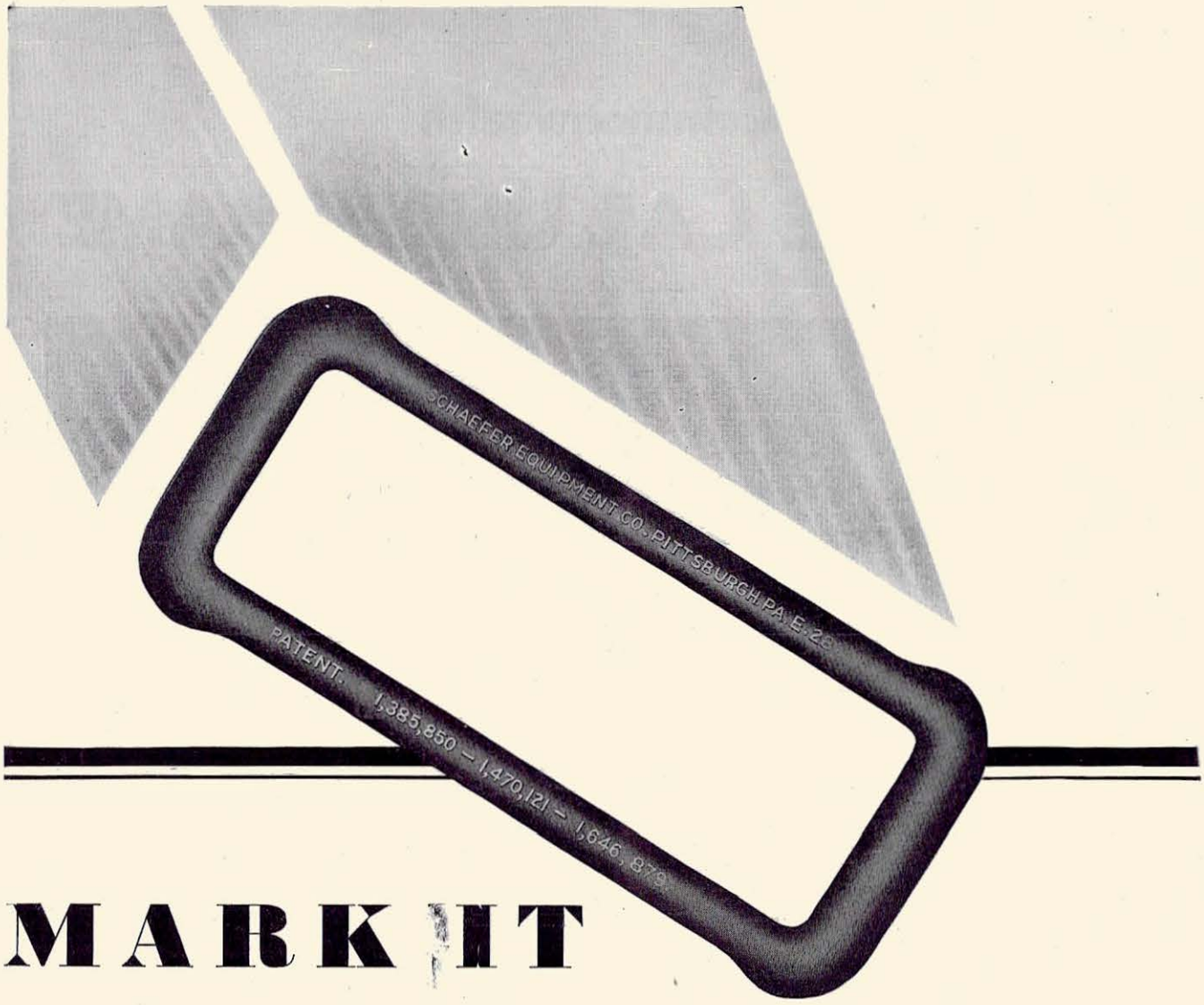
Ideal Construction for All Types of Freight Cars



Caboose Car, with Commonwealth Underframe

GENERAL STEEL CASTINGS CORPORATION

GRANITE CITY, ILL. EDDYSTONE, PENN.



MARK IT DOWN . . .

That nothing but the best Brake Gear Details should ever be used on railroad equipment.

That Schaefer Brake Gear Details cut down maintenance costs, increase safety and increase available car hours.

That Schaefer Brake Gear Details are drop-forged in one piece of special wear resisting steel, free from welds, reinforced at points of greatest stress and wear, and are in accordance with all A.R.A. requirements.

That Schaefer Brake Gear Details assist in keeping cars and locomotives in service at reduced cost.

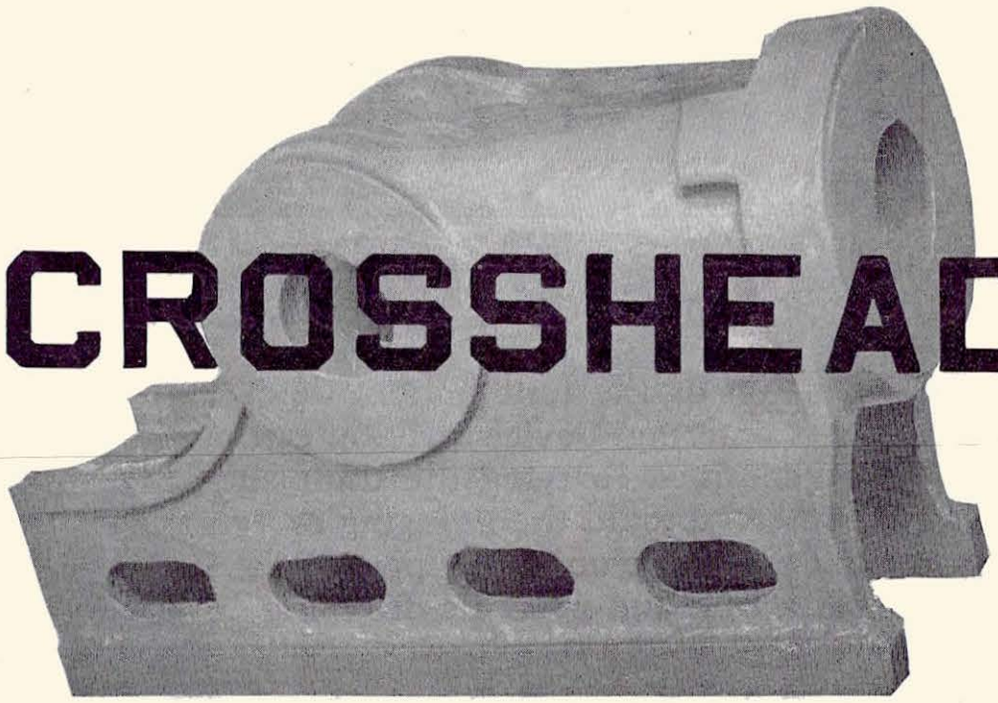
SCHAEFER EQUIPMENT COMPANY

General Offices

KOPPERS BLDG. PITTSBURGH, PA.

"STANDARD S-302"

High Test Steel for



Also
Wheel Centers
Other Miscellaneous Castings

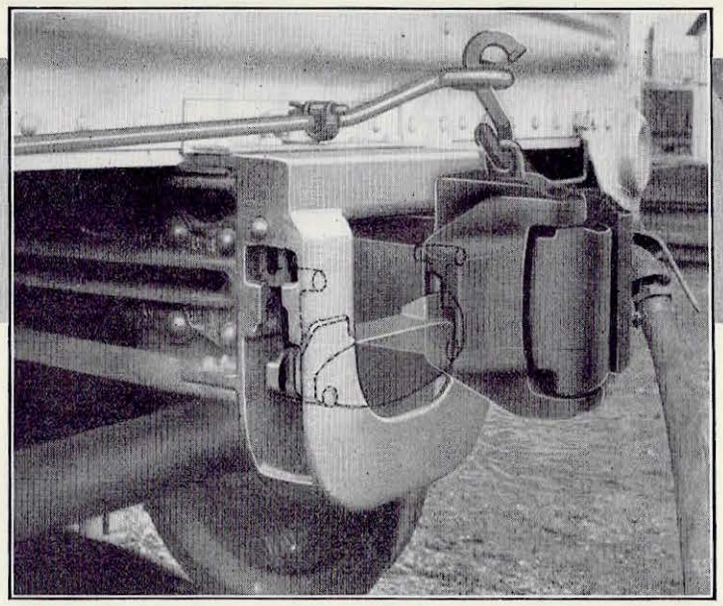
+ + +

Ask our nearest office to send you
specification S-302-31

STANDARD STEEL WORKS COMPANY

General Offices and Works: BURNHAM, PA.

CHICAGO NEW YORK RICHMOND SAN FRANCISCO ST. LOUIS PHILADELPHIA PORTLAND AKRON



Reserve Function

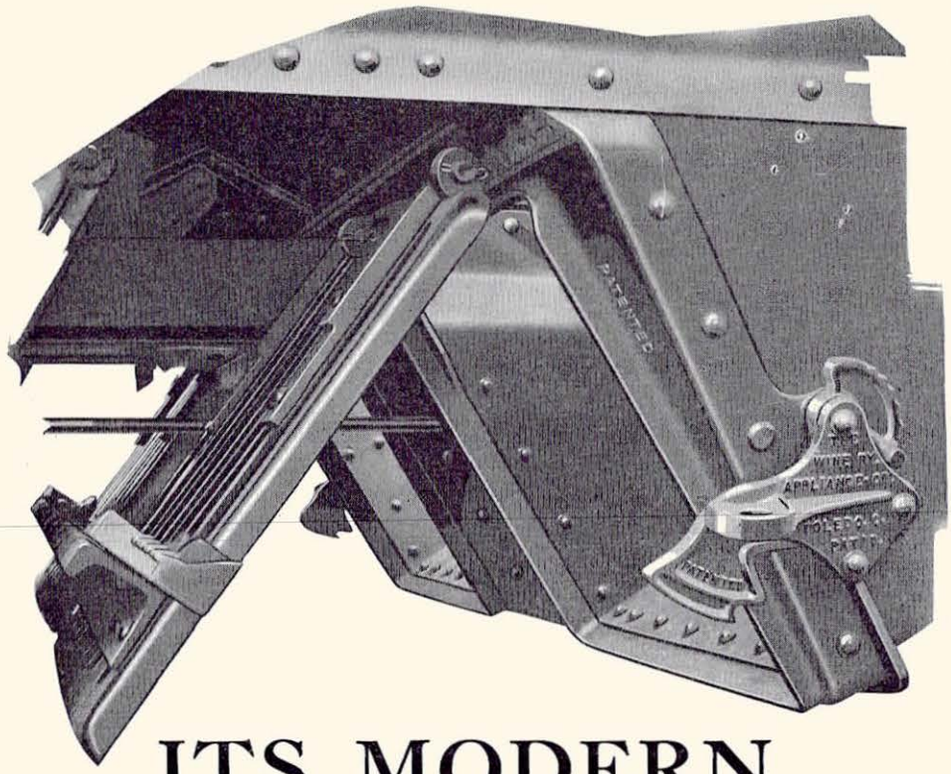
The function of the unit bottom tie of the Union Centering Device striking casting is not confined to tying the draft sills together. Should the swinging carry iron break, the unit tie supports the carry iron and prevents dropping of the coupler.

Union Metal Products Co.

New York Chicago
St. Louis Kansas City
Richmond Houston
Washington
San Francisco
Montreal

THINK OF THE SAVING!

TIGHT DOORS
MAXIMUM SERVICE
NO MAINTENANCE



ITS MODERN

AND PAST EXPERIENCE
SHOWS ITS ADVANTAGES

WINE CAST STEEL HOPPER FRAMES AND DROP DOOR LOCKS INSURE TIGHT DOORS

OUR SERVICE IS YOURS FROM DESIGN TO APPLICATION

Peoples Gas Bldg.
Chicago

The Wine Railway Appliance Co.
TOLEDO, OHIO

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The Safest and Most Economical

Wine DROP DOOR Locks

The Simplest of all Door Mechanisms

The Largest Railroad on the Continent

CANADIAN NATIONAL

Cost of Roof Maintenance on 30,000 Cars Equipped with

DRY LADING ROOFS

18 Years 1913 to 1930 Inclusive-

$4,519.49

Average Per Year
for entire 30,000 roofs—$250.00

Average for 18 Year Period
per roof—15 cents

Average Per Year
per roof—less than one cent

Proves Itself the Greatest Economical Improvement in Car Construction.

Hutchins Car Roofing Company

RAILWAY AGE

Railway Credit and Economy in Operation

The railways have asked the Interstate Commerce Commission for authority to make a 15 per cent advance in freight rates to meet an emergency. An emergency is a temporary condition. It might be assumed that the effects of failing to meet it would be temporary, but this would be entirely wrong. An advance in rates made to meet the present emergency might be temporary, in part or in whole; but the destruction of railway credit that would be caused by not meeting it would have prolonged effects upon the efficiency of railway service and the economy of railway operation. These effects probably would cost shippers many times as much as an advance in rates sufficient to protect railway credit until general business and traffic revive.

Many persons think railway credit is of importance only to owners of securities. It is of much more importance to shippers. Lack of knowledge of railway economics among persons who have much influence on regulation is one of the principal reasons why the railway problem has thus far proved insoluble. There is no form of ignorance of railway economics more widely prevalent than regarding the relationship between railway credit and railway service and operating costs.

Improvements Necessary to Operating Economies

"Further improvements in efficiency and economy in operation brought about by better use of facilities in performing transportation service through progressive and scientific management", said R. H. Aishton, president of the American Railway Association, in testifying in the rate case before the Interstate Commerce Commission, "must largely depend upon the expenditure of large amounts of capital for the improvement of railroad facilities, including equipment;" and he emphasized the importance "of maintaining railroad credit at a point which will permit a continuance of the capital expenditures which are essential, not only that the railroads may provide at all times a machine adequate in every respect to the transportation demands of the country, but also that their business may be conducted at the lowest practicable operating cost." The effect upon operating costs of the inability of a railroad to raise needed capital was well illustrated by facts presented by H. A. Scandrett, president of the Chicago, Milwaukee, St. Paul & Pacific. This railroad made plans for the purchase of 40 modern freight locomotives and the application of boosters to 25 locomotives already owned. A saving of $640,000 annually, or 16 per cent on the investment, would have resulted; but the investment could not be made because the required capital could not be raised. Through its inability to raise capital the Milwaukee road has also been prevented from making this year other additions and betterments which would have cost $1,035,634, and would have produced savings of $333,516, or 32 per cent upon the investment.

The reasons why, under present conditions, most railways cannot make even investments that would produce large economies can be easily shown. (1) A large part of the investment made during the last decade has been made from earnings which might have been paid out in dividends, but, due to conservative financial policies, were not. Extremely few railways are now making surplus earnings which could be invested. (2) Extremely few could now sell stock with which to raise capital. (3) The only remaining means of raising capital is to sell bonds and other evidences of indebtedness. Fairman R. Dick, representing the Security Holders' Committee on the Railroad Emergency, stated in his testimony before the commission that of the 67 largest railways in the country, only 35 have had sufficient net income to qualify their bonds as legal investments for savings banks in New York. Unless earnings are immediately improved the bonds of 20 of these will be removed from the New York legal list for savings banks at the beginning of 1932, leaving the bonds of only 15 eligible as investments. The New York savings banks

eligible list is taken by investors as a standard, and therefore, as Mr. Dick told the commission, present low earnings threaten the ability of practically all the railways of the country to raise capital for some years to come by the sale of bonds.

Effect of Destruction of Credit

The railroads will need to issue new bonds to raise new capital. In addition, more than $1,300,000,000 of their obligations will mature during the next five years and will have to be refunded by the issuance of new bonds, and other evidences of indebtedness, unless the railroads the obligations of which mature are to become bankrupt. They will not be able to issue new bonds either to refund maturing obligations or to raise new capital unless they earn enough on their bonds to make them legal investments for life insurance companies, savings banks, and other large financial and fiduciary institutions which alone have sufficient funds to buy large amounts of bonds. What is meant when reference is made to the danger of the destruction of railroad credit is that there is danger that the railroads will become unable for a period of years to sell bonds and other evidences of indebtedness either to refund old obligations or to raise new capital.

Now, as Mr. Aishton said, "the hope of future economies and efficiencies in operation depends, in major degree, upon a continuation of the policy of replacing the less efficient types of cars, locomotives, and other appliances, and in a continual improvement of the operating conditions on the railroads through a liberal expenditure of capital * * * The most expert workman in the world cannot do his best with poor tools." The relationship between credit and future economies of operation becomes plain when these facts are considered. Continuance of present low earnings even for a short time will impair or destroy the credit of many railroads and render them unable for years to come to raise adequate capital. Inability to raise adequate capital will render them unable to make all the investments that would reduce operating costs. Inability to make these reductions of operating costs would render it impossible to make rates as low as otherwise would be possible. Consequently, the ultimate result of failure to make the advances in rates now required to maintain railroad credit would be to render it necessary to maintain rates higher for a period of years than otherwise would be necessary.

Railway Situation Due to Short-Sighted Policies

Many and large economies in railway operation can be made in future, just as such economies have been made in the past. The series of articles upon potential operating economies that the *Railway Age* is now publishing shows this. But, as Mr. Aishton and other witnesses have pointed out in their testimony, and as the *Railway Age* over and over again has pointed out, large economies have not been effected in the past, and large economies cannot be effected in future, merely by changes in methods. As the *Railway Age* said in an editorial in its issue of July 11, "No great improvement in methods of railway operation ever has been effected without being supplemented by and largely based upon improvements in equipment and other parts of the physical plant." Which would shippers prefer—to avoid an advance in rates now, which may be temporary, or to pay an advance in rates now in order to save the credit of many railroads, and thereby enable them to continue making investments essential to effecting permanent economies and to live upon lower rates in future than they otherwise would require?

The present railway situation is due to the prevalence of short-sighted views in the past. Railway rates were kept unduly low, and traffic was diverted to other means of transportation, by policies followed by governments and shippers when industry and commerce could easily have given the railways enough traffic, and paid them enough for handling it, to have enabled them to have earned reasonable returns. If these policies had not been adopted and followed in years of prosperity the railways would not have had to ask for an advance in rates after two years of depression to avoid destruction of their credit. If such short-sighted views as prevailed during years of prosperity are also to prevail during years of adversity, the outcome must be unnecessarily high railway costs and rates, or perhaps government ownership of railroads, which would be much more costly. Shippers do not want either unnecessarily high costs of operation under private ownership, or government ownership, under which they would be much higher. In the long run they can avoid them only by desisting from supporting government policies, and from following policies in the conduct of their own business, that tend to make them unavoidable.

Freight Traffic in Two Depressions

The trends of freight traffic during the depression of 1921-22 and of 1930-31 have differed in an interesting way. The number of tons carried one mile is the true measure of the volume of freight business, and statistics of ton mileage are now available for the first five months of 1931.

Freight business in 1920 set a new high record. The number of tons carried one mile in the first five months of 1921 was 21½ per cent less than in the first five months of 1920. In the entire year 1921 ton mileage was 23 per cent less than in 1920. In 1922, the second year of the last depression, ton mileage was only 18 per cent less than in 1920. Business began to improve early in 1922, and, in spite of serious strikes on the railways and elsewhere, had become almost normal at the end of the year.

The volume of freight movement also set a new

high record in 1929. In the first five months of 1930 it was only 10 per cent less than in the corresponding months of 1929, but in the entire year 1930 was 14 per cent less than in 1929. In the first five months of 1931, however, ton mileage was 26 per cent less than in the first five months of 1929.

The worst of the depression of 1921-22, as the foregoing facts show, was during the first year of it. In the depression of 1930-31 the first year's decline of freight business has been followed thus far by a second year's decline of much greater severity. However, there is not much difference relatively thus far in the total effects produced by the two depressions on freight business, the loss of 14 per cent in freight volume in 1930 having been exceeded by the loss of 18 per cent in 1922, while the loss of 23 per cent in 1921 has thus far been exceeded by the loss of 26 per cent in 1931.

The most outstanding difference has been between the lengths of the periods during which freight business has shown no substantial signs of revival. In the depression of 1921-1922 it began to increase after having been abnormally small for only 14 months, while in June, 1931, the twenty-third month since car-loadings began to decline, they showed relatively the largest decline during any month of the present depression. Since the middle of June loadings have shown a tendency to improve, but this tendency has been too slight as yet to warrant basing any optimistic forecasts.

In May carloadings were only one-tenth of one per cent greater than in May, 1921, but later statistics show that the volume of traffic, as measured by ton-miles, was 6.4 per cent greater than in May, 1921. In June carloadings were actually four per cent less than in June, 1921, but apparently the ton mileage did not quite decline to what it was in June, 1921. In the first five months of 1931 carloadings were only 2.7 per cent greater than in the corresponding part of 1921, but ton mileage was 7.9 per cent greater. The volume of freight business, measured both by the number of tons hauled and the average length of haul per ton, has, therefore, not as yet declined to what it was in 1921.

"Self-Regulation" of Railways and Utilities

Thomas F. Woodlock, former Interstate Commerce Commissioner, in one of his recent articles covering a wide range of current economic problems which are appearing regularly in the Wall Street Journal, discusses the "self-regulation" of public utilities. By this term is meant regulation by informal conference between utilities officers and regulatory authorities, rather than by formal proceedings before commissions.

On this subject he quotes a recent address by Commissioner Whitsell of the California Railroad Commission, who advocates "amicable adjustments effected around the conference table" and expresses the opinion that much more may be accomplished in this manner in the future. Mr. Woodlock, however, points out certain difficulties which lie in the path of further progress toward this highly desirable goal. "What are you to do about it," he asks, "when on the one hand commissions are afraid to talk across the table with utility companies lest they be accused of trafficking with 'public enemies,' and on the other hand company managers are afraid lest they be walking into the spider's parlor?"

These obstacles are no doubt very real—yet should not an energetic effort nevertheless be made to overcome them? At the recent meeting of the railway accounting officers in Chicago, several speakers favored closer relations with regulatory bodies, looking toward a better understanding to the benefit of both the railroads, the commissions and the public. As a matter of fact, this particular association has gone a long way toward this goal, as is witnessed by its invitation to and attendance by representatives of various governmental departments at its conventions and even committee meetings, and their active participation in the deliberations.

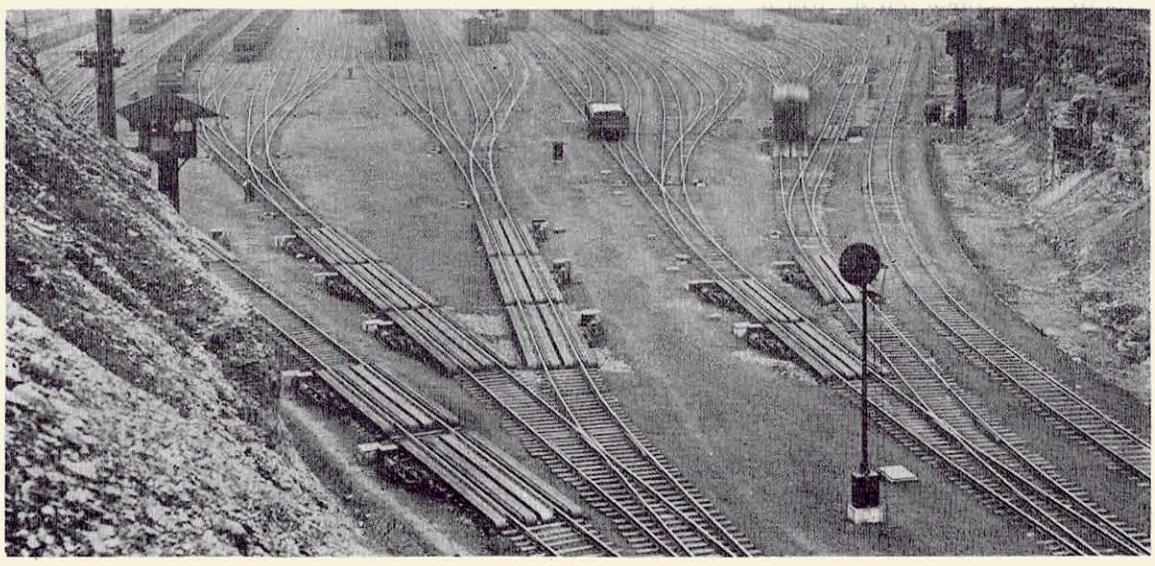
In dealings among individuals and organizations, as in dealings among nations, the initial attitude is usually one of mutual distrust. This can be overcome only when acquaintance has ripened into friendship—or, at least, into mutual respect. And this cannot happen until one side or the other decides to yield its attitude of mistrust and make an independent showing of frankness and complete honesty of purpose. So long as each side waits for the other to make the first move, nothing happens. Such overtures may not always bring immediate response but, if they are persisted in, they cannot do otherwise than weaken even the most obdurate attitude of distrust by the other party.

Regulation such as we have in this country does not flourish elsewhere as it does on this continent. Railway regulation in France, for example, is in the hands of bodies upon which the railways themselves are represented. In Great Britain the same situation obtains, but to a less marked degree. Our type of regulation tends to draw a sharp line of cleavage between the industry to be regulated and those who do the regulating—and may, if mutual distrust reaches the extreme, make the regulatory body appear in the light of a relentless prosecutor and judge combined, a modern Judge Jeffreys interested rather in vengeance than in justice.

But the line of cleavage between the regulated and the regulators need not be so sharply drawn even under our system if a spirit of mutual frankness and respect can be developed. The only way to develop that spirit is for everyone who enters such relationships first to manifest such an attitude himself. Regulation accomplished on such a basis would be far better, both for the railways and the public, than the type we now too frequently have.

Car Retarders Accomplish Definite Savings in Yard Operation

Reduce cost of classification, expedite train movement, release locomotives, decrease claims



Car Retarders in the Pitcairn Yard on the Pennsylvania Resulted in a Saving of $200,000 Annually

THE installation of power switches and car retarders in a classification yard of suitable traffic characteristics will make possible a saving in operating expenses of from 18 to 40 cents per car classified, an amount which will ordinarily pay a return of 25 to 40 per cent annually on the cost of the improvement. The tangible savings include the wages of car riders, switchmen and engine crews eliminated, while the intangible but nevertheless real benefits include reductions in personal injury claims and in damage to equipment and lading, and the advantage of being able to provide quicker service.

Because retarders have demonstrated their ability to facilitate yard operation and reduce operating expenses in such definite ways, approximately 40 yards have already been equipped with them during the six years since they were first introduced, and as their possibilities become more fully realized, it becomes evident that opportunities exist for equivalent savings to be made in many other yards. Furthermore, the retarder equipment and the design of yards have been developed to a point where the system can now be applied with decided savings to layouts smaller than those where a hump and riders were formerly considered to be justified.

Facilitate Yard Operation

The fact that car retarders facilitate the operation of a yard results not only in expediting the traffic normally tributary to this yard, but also makes possible the reduction of operating expenses by the transfer of additional classification work from other yards, or by utilizing the yard crews and locomotives for part-time duty at other points. This additional capacity of a yard equipped with retarders arises by reason of the fact that the classification capacity of the layout is constantly available, there being no delays waiting for riders, etc.; neither is the operation of the yard slowed down during stormy weather or extreme temperatures. This ability to keep a yard in continuous operation at capacity is of decided assistance in completing the make-up and dispatching of trains. For example, if 40 per cent of the total day's traffic is received during the first trick, as is often the case at Russell, Ky., on the Chesapeake & Ohio, it is possible to classify these cars quickly and forward them without delay,

whereas before the retarders were installed continuous operation of the hump was necessary in order to classify the total day's receipts and, as a result, some of the cars were delayed longer in the receiving yard than is now necessary.

Likewise, it may be desirable to operate certain yards at full capacity for short periods each day without maintaining a large force of riders. Such a problem was solved by retarders in the yard of the New Haven at Providence, R. I., where incoming traffic in the morning must be classified and forwarded or delivered to industries without delay. Similarly, since retarders were installed in the Big Four yard at Sharonville, Ohio, cars are being delivered to the team tracks, freight houses and connections in Cincinnati on an average of 1 hr. 30 min. sooner than before, saving approximately $40 a day in per diem charges alone.

The fact that a yard equipped with retarders can be operated at peak capacity for a short time or for a longer period, as desired, operates advantageously in two ways. For example, the operation of the Pitcairn yard on the Pennsylvania was reduced to two 8-hr. split tricks soon after the retarders were placed in service, and even then departing schedules were maintained with closer connections than were before possible. On the other hand, in a Norfolk & Western yard, where conditions were such that it was formerly more economical to operate only two tricks with car riders in order to reduce operating expense, it was of decided benefit to extend the operation to full three tricks when retarders were installed, thus eliminating delays in the receiving yard and permitting the more uniform spacing of departing trains.

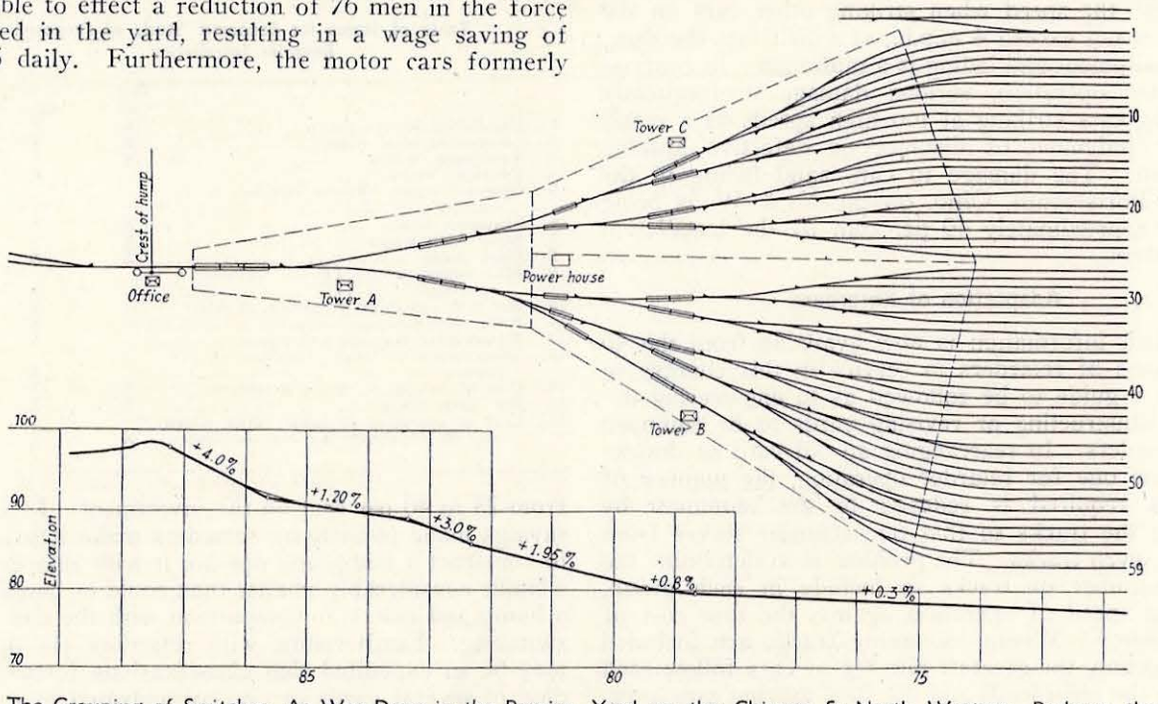
Reduction in Yard and Engine Crews

The principal item of expense in the operation of a yard is wages of employees. Where power switches and retarders are installed, the switchmen and car riders are replaced by two or three retarder operators. Likewise, the operation of the yard is almost always expedited to such an extent as to permit the release of one or more locomotives. For example, the installation of retarders in a yard on the Pennsylvania made it possible to effect a reduction of 76 men in the force employed in the yard, resulting in a wage saving of $444.95 daily. Furthermore, the motor cars formerly used for hauling the car riders back to the hump were no longer required, thus saving $1,210 annually. In addition, the two-trick operation permitted the release of four locomotives, thus saving $40,296 more annually.

When retarders were installed in a yard on the Chesapeake & Ohio, a sufficient number of car riders and other employees were relieved, and locomotives were used to so much better advantage, that the total direct saving in operating expenses approximated $200,000 annually, which represents a return of 40 per cent on the investment for the retarder installation, over and above interest and depreciation. Figuring the saving on an average of 2,750 cars handled daily, the yard operating costs are reduced from 43 to 18 cents per car.

Likewise, when the Lehigh Valley installed retarders in a classification yard at Coxton, Pa., at a cost of approximately $240,000, the operating costs were reduced 27 cents per car classified, and as about 305,000 cars were classified during 1929, the saving was over $82,000. When the yard at Marion, Ohio, on the Erie was enlarged and equipped with retarders, 12 car riders and three switch tenders were eliminated on each trick. The resulting wage saving, together with that occasioned by a reduction in the number of yard engines, has effected an average reduction of 32 cents for each car classified. The yard improvements at this point cost $597,000, including $240,000 for retarders, power switches, communication system, floodlighting, etc. On the basis of the present sub-normal traffic, the savings total $175,000 annually, equivalent to 30 per cent on the investment, and when classifications now handled in other yards are transferred to Marion this percentage will increase.

As another instance, the installation of retarders in the Norfolk & Western yard at Portsmouth, Ohio, permitted the release of 25 car riders, 4 switch tenders and 1 motor-car operator on each trick, the yard being operated on a two-trick basis. Furthermore, one locomotive now handles the yard operation, the west-end engine and the trimmer no longer being required.



The Grouping of Switches, As Was Done in the Proviso Yard on the Chicago & North Western, Reduces the Number of Retarders Required

Considering only the items mentioned, the operating costs at this yard are reduced 22 cents per car classified.

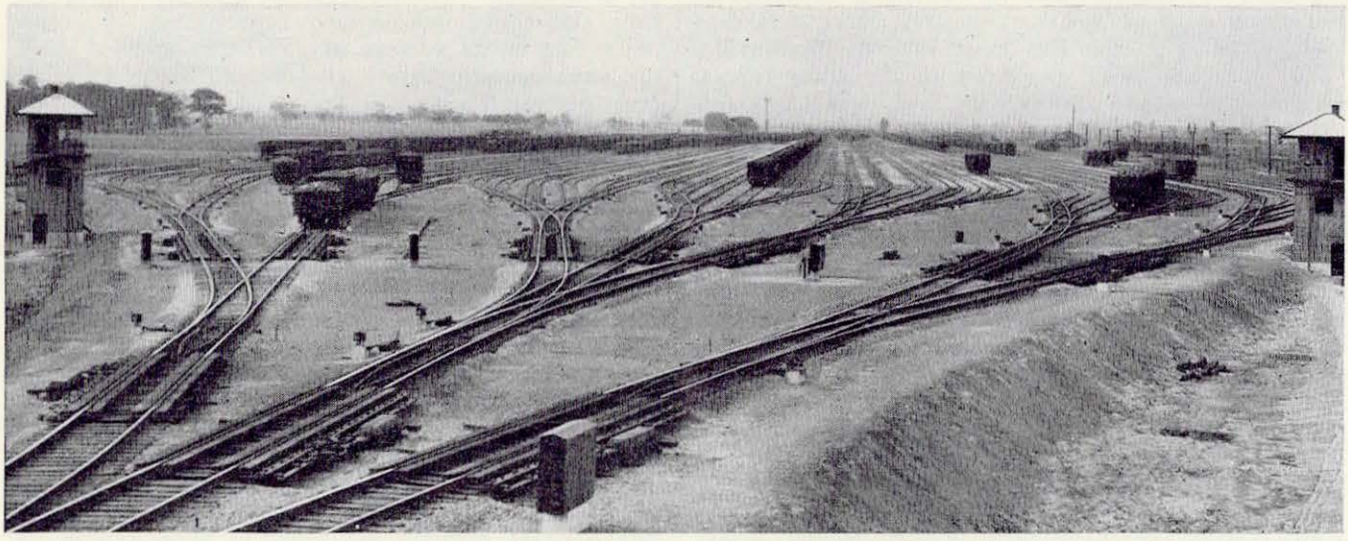
Reduction of Personal Injury and Damage to Equipment and Lading

Another sizeable item in the operating expense of many large yards is the payment of personal injury claims to car riders and switchmen. As such employment is not steady, many of these men are floaters, and by reason of their inexperience and carelessness, accidents are numerous, especially in bad weather. At one yard on the Big Four it is estimated that the installation of retarders has reduced the personal injury claims over $3,000 annually.

Likewise, with retarders the damage to equipment and lading is reduced to a minimum. In a retarder-equipped yard, the speed of a car leaving the last retarders in a route is reduced to about 4 m.p.h., and as the grade of the yard tracks is only about 0.3 per cent as a maximum the average car does not accelerate. Therefore, the speed when striking other cars on the track does not exceed 4 m.p.h., at which rate the damage to equipment and lading is a minimum. In contrast with rider operation, serious damage is frequently caused by cars striking at too high speeds as a result of poor judgment of distance or defective braking equipment. The damage to cars aand lading in the yard at Portsmouth, Ohio, on the N. & W. is being reduced approximately 40 per cent by the installation of retarders.

Adaptation of Retarders

Sufficient information is now available from the 40 installations of retarders in service in this country to serve as a guide to be followed as to engineering details in constructing or revising yards to be equipped with retarders. In rearranging an old yard or designing a new one for retarder operation, the number of retarders required is reduced to the minimum by grouping the tracks so that one retarder serves from three to seven tracks. The problem is to determine the proper number of tracks to include in each group, balancing speed of operation against the first cost of the retarders. Where too many tracks are included in each group, the greatest number of cars follow each other on the main leads and the slow-moving cars interfere with the faster-moving ones. Continuity of operation is another important factor, because if traffic is bunched or can be held back so as to be classified on one or two tricks, it may be more economical to install the fastest possible arrangement. On the other hand, if the traffic flow is steady, requiring operation of the yard for all three tricks on a schedule that will permit slightly more time for classification, the arrangement with a larger number of tracks in a group and with fewer retarders, may be best suited to the local requirements. Also, the reduced first cost of the retarders, brought about by the track group arrangement, extends the field for such equipment to the smaller yards.



The Car Retarder System Is in Service in the Stanley, Ohio, Yard on the Ohio Central Lines of the New York Central

Likewise, data are available as to the savings being accomplished under various operating conditions so that a very close estimate can be made concerning the economies of a proposed installation. In general, it may be said that if the traffic is such that hump operation is justified, then retarders will pay a return of from 25 to 40 per cent on the investment. In fact, the savings made possible by retarders make it practicable to construct a hump and operate it with retarders with a traffic considerably smaller than could be handled with a hump and riders, in comparison with the cost for flat switching. Furthermore, with retarders, the operation may be so expedited that classifications formerly handled in several yards can be concentrated in one modern yard. Thus, at Fort Worth, Tex., the Texas &

Table of Items for Economic Study of Proposed Retarder Installation

		Flat yard	Hump with riders	Hump with retarders
1.	Locomotive costs	X	X	X
2.	Locomotive crew wages	X	X	X
3.	Switchmen wages	X	X	
4.	Car-rider wages		X	
5.	Operator wages (Power switches or retarders)		X	X
6.	Skatemen wages	X	X	
7.	Supervision wages	X	X	X
8.	Clerk wages	X	X	X
9.	Maintainers' wages (Power switches or retarders)		X	X
10.	Motor car expense for return of riders		X	
11.	Motor car operators' wages		X	
12.	Maintenance material and power		X	X
13.	Depreciation (Power switches or retarders)		X	X
14.	Cost of damage to cars and contents	X	X	X
15.	Per diem charges	X	X	X
16.	Cost of operation in other yards which may be eliminated by new facilities	X	X	

Pacific classifies both eastbound and westbound traffic over one hump while a yard near Chicago, designed for inbound traffic, also handles some outbound classifications.

A close estimate can be made of the economies of a proposed installation of retarders if a careful study is made of the existing operation in order to determine the requirements demanded by the class of traffic handled and the facilities and personnel needed for the proposed operation. Care should be given in estimating the locomotive and man-power required, since therein lies the greatest chance for error. For example, the maximum rider efficiency should not be used in combination with the maximum locomotive efficiency since the use of a minimum number of riders will cause a loss of locomotive time. The decision to install retarders is based, usually, upon the tangible savings, the major items of which are given in the accompanying table. Three columns at the right show the type of yard to which the items of expense apply.

In Next Week's Issue

In the realm of the application of machines designed as substitutes for more costly manual processes, there is probably no department wherein greater technical development has taken place in recent years than in that of mechanical accounting. Such machines, provided there is enough work to keep them busy, can usually pay heavy dividends on the investment in them. An adequate volume of work to justify the installation of machinery can be secured if accounting operations are centralized. Such centralization usually also produces better and more accurate records. In next week's article centralization of accounting will be discussed, with definite figures as to its savings in labor and dollars.

New Haven Uses Trucks to Speed L. C. L. Delivery

"ACCEPT to-day—deliver tomorrow" is the keynote of a re-vamping of the entire l. c. l. freight service of the New York, New Haven & Hartford, the final step of which went into effect on July 20, and which provides next-day delivery from any point on the New Haven lines to any other point on the system, with very few exceptions.

The "accept to-day—deliver tomorrow" plan is made possible by an extension of the basic principles used in the recent inauguration of two fast merchandise freight trains the "Speed Witch" and the "Maine Bullet," described in the *Railway Age* of June 27, page 1257. Both of these trains were made possible through the use of motor trucks to feed and distribute freight to and from points of concentration and distribution, thus serving surrounding territory to the maximum.

Concentration points for the "accept today—deliver tomorrow" plan are Boston, Providence, New London, New Haven, Hartford, Pier 37 New York, Bridgeport, Putnam, Worcester, and Waterbury. The plan has been placed in service in successive stages, being first put in effect on June 22 between the concentration points of Boston and Pier 37, East River, New York. On June 30 it was placed in operation at New Haven and Providence, on July 6 at Hartford and Bridgeport, and on July 20 at the remainder of the concentration points.

The motor trucking portion of the operations is handled by the New England Transportation Company, highway subsidiary of the New Haven, which now has in operation 92 trucks, 18 tractors and 33 semi-trailers. The new service will be started with that equipment, but the situation will be watched closely with the intention of placing additional equipment in service as the need for it develops in the working out of the new overnight delivery plan.

The only points on the New Haven system which will not have the benefit of overnight service to all other points are stations on Cape Cod south of Middleboro, Mass., and stations in the old Central New England territory west of Danbury, Conn., and Millerton, where second-day delivery will prevail. These territories, however, will have the benefit of overnight service to many portions of the line.

The new service is designed primarily to meet the competition of motor trucks, and, it is said, already has resulted in bringing back to the railroad considerable business which had been moving via other transportation agencies.

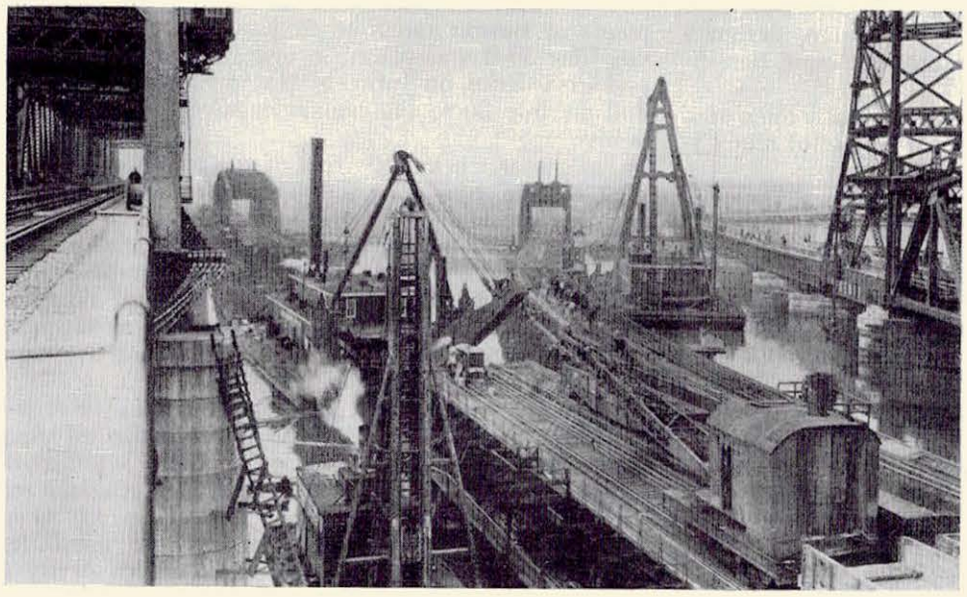
The longest truck hauls under the set-up of operation will be out of New London—night trips from New London, Conn., to Hartford and Waterbury, which it is not as practicable to make by rail as by truck. Rail service is being utilized, however, as far as possible, in order to lighten the load on the trucks; and their function, with a few exceptions of this kind, is to act merely as feeders into and distributers from the major points above mentioned.

It is expected that when the new system is functioning smoothly, between 90 and 95 per cent of all local freight stations on the New Haven will be covered by this overnight service, and that a considerable proportion of interline freight will also benefit from the speeding up process.

An Example of the New Service

As an example of the improvement brought about by the new scheme of operation, a shipment from Greenwich, Conn., destined to Warren, R. I., would require two to three days under the old system, instead of having next day delivery as is provided by the new. Under the old system, there not being sufficient freight from Greenwich to Warren to make possible a direct car from one place to the other, the shipment would have been put in either a Bridgeport or Cedar Hill car, and on arrival there would have been transferred to another car. If there was sufficient Warren freight that day from the new point to justify a direct car it would then go direct, thus giving second day delivery, but if not it would be put in a Providence car, necessitating another transfer operation at the latter point, and making a three-day delivery of the shipment.

Under the "accept today—deliver tomorrow" plan, the shipment is picked up by motor truck at the Greenwich freight station and taken into Bridgeport, the nearest concentration point; there it is placed in a car bound for the nearest distribution point to Warren, which is Providence, arriving there the next morning, and goes out in regular service on the truck distributing to various freight stations, including Warren, thus providing next day delivery from Greenwich.



Looking West Between the New Bridges, Showing the New Passenger Bridge on the Left and the Two Old Bridges in Between—Old Trestle Approaches Are Being Removed to Clear the Channel Served by the New Lift Spans

Special Features Used in New Lift-Span Bridges

Two constructed by Pennsylvania have unusual cable weight equalizers and are controlled from one point

ON November 2 and 3, 1930, the Pennsylvania railroad placed in service over the Hackensack river, just west of Jersey City, N. J., two large lift-span bridges, which, although under construction less than 22 months, involved a large amount of work and numerous unique problems. The new bridges, one for passenger and the other for freight traffic, are double-track structures, the former having a total length, including viaduct approaches, of 2,950 ft., and the latter a total over-all length of 1,188 ft. Together, the bridges and the line changes made in connection with them involved an expenditure of about $9,000,000.

The new bridges are located on the heavy-traffic line between Manhattan transfer, just east of Newark, N. J., and Jersey City, and carry not only the Pennsylvania's freight and passenger trains into Jersey City but also all of the trains of the Hudson & Manhattan Railroad between Newark and New York. The crossings of the Hackensack river are in a general easterly-westerly direction, but at an angle with each other, which puts them about 140 ft. apart at the east bank of the river, and about 500 ft. apart at the west bank. The bridges are essentially the same in design, although each embodies certain features peculiar to itself, owing to the different angles of skew at which they cross the river channel and to different operating conditions.

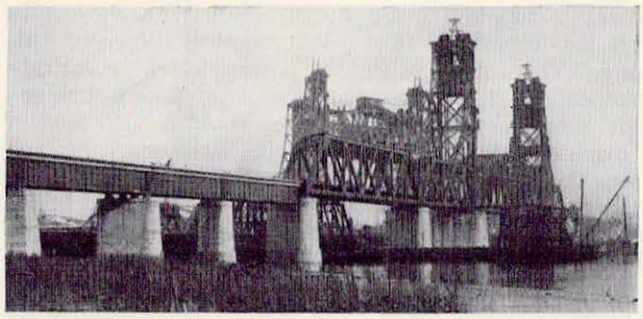
In the case of the passenger bridge, which is the more southerly of the two structures, the lift span is 322 ft. 6 in. long center to center of bearings, and provides minimum under-clearance of 40 ft. above mean high water, and a clear channel width of 166 ft. In the case of the freight bridge, on the other hand, the lift span is 198 ft. 10 in. long center to center of bearings, providing a clear channel of 158 ft., and minimum under-clearance of about 13 ft. above mean high water.

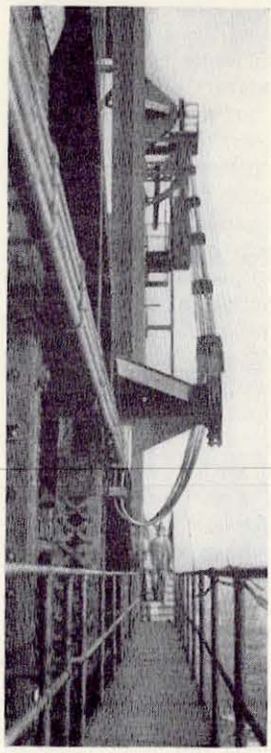
Replace Two Swing Bridges

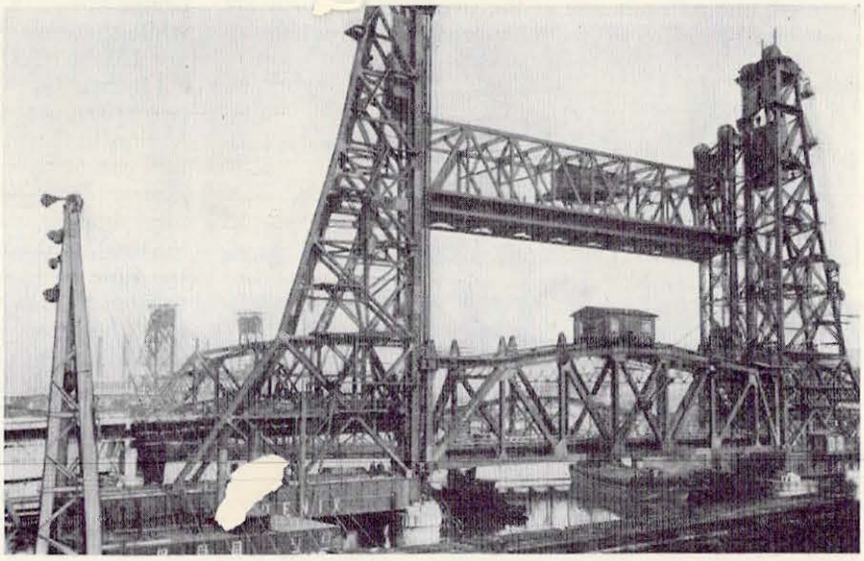
The new bridges replace old swing bridges with pile trestle approaches, which were located between the sites of the new bridges. The old bridges, which were constructed in the nineties, each presented two clear channels, 60 ft. in width, but the passenger bridge provided under-clearance of only 10 ft. above high water, and the freight bridge only 6 ft. These small under-clearances necessitated the opening of the spans for practically all classes of river traffic, and this, coupled with the slow operation of the swing spans, interfered seriously with the movement of trains, particularly commuter trains.

The narrow channels afforded by the old bridges were also an impediment to river traffic, and, furthermore, there was constant concern that at any time the railroad structures might be damaged by one of the larger vessels and cause a complete tie-up of train operation. These conditions, coupled with the necessity of replacing the bridges for the use of heavier locomotives and to avoid excessive maintenance, led to the construction of the new bridges.

A study of the volume and character of the river traffic disclosed that about 75 per cent of the vessels passing the bridges were less than 40 ft. in height and pointed, therefore, to the provision of a minimum under-clearance of 40 ft. in the new passenger bridge. In the case of both bridges, full openings of the lift







Three Views of the New Bridge —At the Top, a General View from the Southwest; At the Left, One of the Four Cable Equalizing Devices on the Lift Span Carrying the Power Cables to the Machinery House; At the Right, the New Freight Bridge Span with the Lift Span of the Adjacent Highway Bridge in a Raised Position

spans provide an under-clearance of 135 ft. above mean high water. Building the new bridges on new alinements involved the construction of considerable new trackage but greatly facilitated the work, particularly in view of the fact that the river had to be kept open for traffic. Another factor of importance which tended to simplify the final work of erection was the shifting of the channel from the west side of the river, about 400 ft. east to the east side. This made it possible to construct both bridges complete, including the lift spans, except for the one fixed span of each bridge directly in line with the old channel which were placed by special means as described later.

All of the spans of both bridges rest on concrete masonry piers, and it is interesting to note that all of the river piers of the freight bridge were made sufficiently long in each case to carry also the spans of a new highway bridge over the river, constructed by the state simultaneously with the construction of the two railroad bridges. All of the combination river piers for the freight and highway bridges, as well as those carrying the passenger bridge, are provided with a belt course of granite masonry within the tidal range to protect the concrete against the deteriorating action of the tide water in the river and the damage from ice and floating debris. All of the river and approach spans of both railroad bridges, with the exception of the lift spans, the tower spans of the passenger bridge, and the passenger span which was floated into place, are provided with reinforced concrete slab decks, with an average thickness of 12½ in., which carry standard rock ballast sections.

Features of Lift and Tower Spans

The lift spans of the new bridges, except for a few details, are somewhat similar in design to a number of other lift spans constructed in the same general territory during the last few years, including the four two-track lift spans of the bridge of the Central of New Jersey over Newark bay, the two-track lift span of the Pennsylvania-Lehigh Valley bridge over Newark bay, and the three-track lift span of the Lackawanna's bridge over the Hackensack river, about one-half mile north of the Pennsylvania's new bridges.

The essential differences in the two lift spans are that the passenger bridge span is 123 ft. 8 in. longer than the freight bridge span and has square ends, while the freight bridge span has skew ends of 60 deg. 59 min. Both spans are designed for an equivalent of about Cooper's E-75 loading and are made up of two riveted Pratt trusses with broken upper chords and vertical hanger members at each end.

Silicon steel was used as the main material in the members of the trusses of the passenger bridge lift span, the 245-ft. through truss span, which was floated into place and the 177-ft. deck truss span of the passenger bridge. Carbon steel was used throughout in the freight bridge and for the floor system, rivets and details of the passenger bridge. A basic unit stress of 24,000 lb. per sq. in. was used for the silicon steel and 16,000 lb. per sq. in. for the carbon steel.

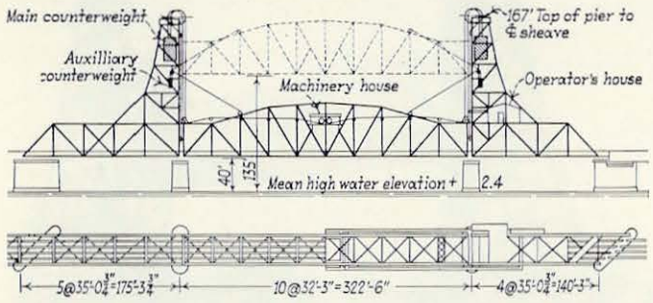
The main difference between the tower spans of the two bridges is that the towers of the passenger bridge are integral parts of the flanking truss spans, while in the case of the freight bridge, the towers are supported on deep box girders placed outside of the deck girder spans that support the tracks in the spans flanking the lift span.

The passenger bridge span is connected to the counterweights by sixteen 2¼-in. cables at each corner of the span, these cables being divided into two groups of 8 cables each that pass over separate sheaves at the top of the towers, one sheave being located to the rear and

outside the other to avoid structural complications. The same arrangement prevails on the freight line bridge, except that there are twelve 1⅞-in. cables at each corner.

Special Cable Weight Equalizers

The equalizing arrangement on the bridges for compensating for the shifting weight of the main cables from the span side to the counterweight side and vice versa, differs from the A-frame rocker bent arrangement used on the Newark Bay and other Hackensack River lift-span bridges built in recent years. In the arrangement used, four auxiliary counterweights are provided, one on each side of the two towers, which are suspended by cables over double-groove sheaves mount-



Lift Span Group in the Passenger Line Bridge

ed out on the sides of the towers, at a height corresponding to the mid-height of upward travel of the third points of the upper chords of the lift span trusses. From these sheaves the cables extend to fixed sheaves attached to the tops of the upper chords of the lift span trusses at the third points in their length. Through this arrangement, when the lift span has been raised less than half of its full opening, the vertical component of the tension in the four parts of the equalizing arrangement comprises an upward pull on the span and when the span, on the other hand, has been raised above the mid-point of its upward movement, this vertical component is in the reverse direction and effects a downward pull on the span.

The main advantages set forth for this type of equalizing arrangement are: (1) that there is no rocker bent on top of the lift span trusses to interfere with overhead aerial cables; (2) that the auxiliary counterweight cables and other parts of the equalizing arrangement are more readily accessible for inspection and repair than in the case of the rocker bent arrangement; (3) a material saving in the weight of the equalizing arrangement by eliminating the rocker bent and necessary attachments; and (4), a reduction in the amount of cast iron in the auxiliary counterweights, due to increasing the inclination of the counterweight ropes. The first of these advantages proved not to be a factor on the new bridges at the present time, since it was decided to carry all power and signal circuits across the river in submarine cables. However, this advantage will be effective in future overhead a.c. electrification, in which case power lines will be carried overhead.

Four Sources of Power Provided

Both lift spans of the new bridges are operated and controlled from a single operator's house in the east tower of the passenger bridge, and, to insure against a power failure, four independent sources of power are provided for the operation of the spans. Two of the sources of power are the two independent 650-volt d.c. circuits of the railroad supplying the third rails of the passenger mains, while a third source of electrical power is supplied through connection with the 4,150-volt a.c. circuit of the Public Service Electric Company. The fourth source of power, which is entirely independent for each span, consists of gasoline-engine, mechanical-drive units, one of which is located in a machinery house on each of the lift spans. In each case, the electric power is converted to 550-volts d.c., by motor-generator sets located in a generator house directly beneath the operator's house in the east tower span.

Under normal conditions, operation of the lift spans will be by power taken from one of the two third-rail circuits. The span operating motors on the passenger bridge span are 260-hp. 550-volt, d.c., mill-type motors, while those on the lighter lift span of the freight bridge are 135-hp., 550-volt motors of the same type.

Ordinarily, the span-operating motors on each of the two spans are operated together, but as a further protection to the electrical operation of the spans, the motors can be operated separately if it should become necessary to cut one out for any reason. With both motors running, the freight bridge span can be raised or lowered in two minutes, while if only one motor is used, the time of raising and lowering the span is increased to about three minutes. With both motors in operation, the passenger bridge span can be raised or lowered in 100 sec., while the time is increased to about 150 sec. when only one motor is used. Operation is safeguarded by an approved arrangement of limit switches, solenoid brakes, etc.

The merchanical drive unit on each span, which is provided for use in the event of a complete electrical failure, is a 6-cylinder, 165-hp. gasoline engine, clutch-connected to hoisting machinery, which, in turn, is gear-connected to the main span driving shaft. Operation of the spans by this equipment is considerably slower than by the two span motors and must be controlled by operators in each of the machinery houses.

Operation Interlocked With Signals

The operator's house is essentially one long room in which are located an electro-pneumatic interlocking machine, an illuminated track diagram, power circuit panels and twin bridge controls. Electrically actuated dials for each bridge and a complete system of light indications showing when each span is properly seated, together with a panel board for control of all electrical power combinations are provided. Train operation over the bridges is controlled by position-light signals and smash boards interlocked with electro-pneumatic, plunger-type rail locks and circuit controllers. No span locks are provided on either bridge.

Final Work of Construction Interesting

One of the most interesting phases of the bridge construction work arose during the closing-in stage and the transfer not only of the rail traffic to the new bridges, but also of the river traffic from the old channel to the new. This work involved the setting in of a fixed span in each of the new bridges, shutting off the old river channel which had been kept open throughout the work, and the dismantling of the east approach trestles to the old bridges in order to clear the new channel. All of this work was accomplished without interference with the movement of trains and with a minimum of interference with river traffic.

The final closure span of the passenger bridge, which is a through Pratt truss span, 245 ft. 5 in. in length, was constructed complete, including the deck, on a series of pile clusters in the river, immediately south of the bridge, and, at the appointed time, was floated into po-

sition on two barges with the aid of the tide. The final span in the freight bridge, a 116½ ft. deck plate girder span with a concrete deck slab, was erected in place, unit by unit. In order to carry out the work on this span in the most expeditious manner, the deck girders and a number of the precast sections of the deck slab were floated to the site of erection on a barge, and were then set in place by a barge derrick. Some of the concrete deck sections were lined up on the spans adjoining the closure span and were set in place by a locomotive crane working from the bridge tracks.

Upon the completion of the work of floating in the passenger bridge span, passenger traffic was moved from the old swing bridge to the new lift bridge. Simultaneously with this work, the State Highway department floated into position the last fixed span of its new bridge adjacent to the freight bridge, after which the final span of the freight bridge was constructed and opened to traffic, this entire work requiring about 30 hr.

To clear the new channel of the old double-track pile trestle approaches to the two old railroad bridges involved the removal of about 700 lin. ft. of deck structure and approximately 1,500 timber piles. In accomplishing this work, the old decks were sawed into sections about 12 ft long, which were then removed by locomotive cranes and floating derricks and loaded on to barges. A dredge dipper was used to bite off the piles about 45 ft. below water. In less than 60 hr. after the demolition work was started, the new channel had been cleared, deepened and opened to river traffic.

Foundation Problems Varied

Obtaining suitable foundations for structures in the Hackensack River bottom and the marshes west of the river has always been a difficult problem and there was no exception in the case of the Pennsylvania's two new bridges. After carefully placed test borings disclosed the character and depth of the soil penetrated, three distinct types of foundations were decided upon as the most practical and economical under the conditions encountered; timber piles, footings put down in pneumatic caissons, and multiple-shaft footings.

In the river, where soft mud extends down from 47 ft. to 52 ft. below mean water level, and where rock lies from 88 ft. to 125 ft. below mean water, pneumatic caissons were used to put down all of the pier footings for both bridges. With the exception of the two most westerly river piers of the passenger bridge, which were given bearing on hardpan at elevations of —102.5 and —94.9 respectively, all of the piers were carried down to rock, the deepest being 119.46 ft. below mean water level. Th largest caissons used were those for the lift span piers of the passenger bridge, these being 68 ft. long by 29 ft. wide.

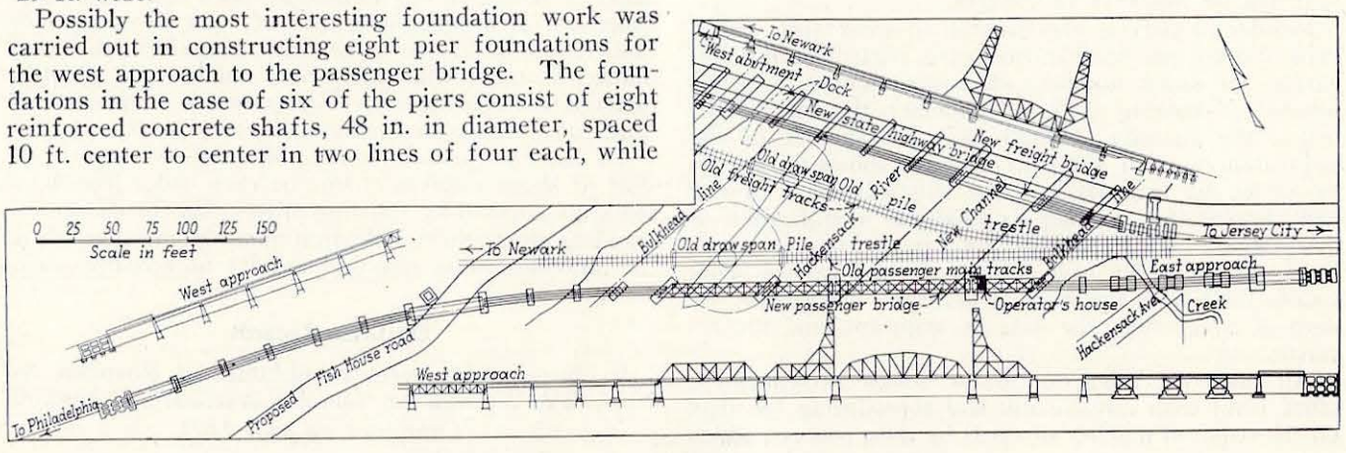
Possibly the most interesting foundation work was carried out in constructing eight pier foundations for the west approach to the passenger bridge. The foundations in the case of six of the piers consist of eight reinforced concrete shafts, 48 in. in diameter, spaced 10 ft. center to center in two lines of four each, while those for the two other piers consist of 10 reinforced concrete shafts, 54 in. in diameter, spaced 10 ft. center to center in two rows of five shafts each. In all cases the bottoms of the shafts are belled out so that the enlarged bases form a continuous plane of support. The depth of the footings ranges from 66 ft. to 77 ft. below mean tide, and in all cases support is had on hardpan.

In the method employed for sinking these footings, the first step consisted of boring the shaft holes to hardpan, using a specially designed auger with a water jet. The auger, which was about one inch greater in diameter than the size of shaft being sunk and provided with either three or four cutting blades, was propelled by a high-power drilling machine mounted on caterpillar treads. The drive shaft of the auger, which was lengthened as depth was gained, consisted of extra-heavy 10-in. steel pipe in 12-ft sections, with bolted flange connections which were themselves screwed on and welded to the shaft lengths. In combination with the water jet, the auger produced a semi-liquid core back of it, which, for the time being, was left in the well to prevent the sides from caving.

In its downward movement the auger first penetrated a deep layer of soft muck, which overlies irregular layers of heavy clay and sand. Hardpan was struck generally from 60 ft. to 70 ft. below the mean water level under the bridge. When the auger reached hardpan it was withdrawn and a corrugated culvert pipe casing was sunk in the well to permit excavation for the concrete.

With the casing in place, the core material was excavated, first with a well bucket where the material was relatively soft, and later with a small orange-peel bucket when stiffer sand and clay were encountered. It had been hoped that further excavation in forming the bells at the bases of the wells would have been possible under atmospheric pressure, but the seepage of water into the wells prevented this and made the use of compressed air necessary. Accordingly, an air-lock was placed on top of each well and the belling out operations were accomplished by men working under about 35 lb. pressure, using pneumatic spaders.

Following the completion of the excavation in each shaft well, mat reinforcing consisting of 1-in. square bars was placed in the bases of the belled footings, and reinforcing cages consisting of 1-in. round rods and ½-in. rod hoops were placed in the shafts, all of this work up to within about 25 ft. or 30 ft. of the surface being done under air pressure. In order to spread the load of a pier uniformly over all of the footing shafts in a cluster, a monolithic concrete mat, four feet thick, was poured on top of the shaft cluster at the ground level, this in turn carrying the exposed pier shaft.



General Location Map of the New and Old Bridges

The Hackensack River bridges were built under the direction of A. C. Watson, chief engineer of the New York zone of the Pennsylvania, while they were designed under the direction of A. R. Wilson, engineer of bridges and buildings and erected under the direction of T. W. Pinard, engineer of bridges and buildings. The work in the field was under the direct supervision of J. J. Vail, construction engineer, assistant to T. T. Kline, engineer in charge.

The contractors on the work included the Bethlehem Steel Company, Bethlehem, Pa., which fabricated and erected all of the steelwork in connection with the passenger bridge: the Phoenix Bridge Company, Phoenixville, Pa., which fabricated and erected all of the steelwork in connection with the freight bridge; the Arthur McMullen Company, New York, which constructed the river piers of the passenger bridge; the Foundation Company, New York, which constructed the river piers and west approach piers of the freight bridge; Senior & Palmer, Inc., New York, which constructed the group shaft footings and the piers for the west approach to the passenger bridge; and J. Rich Steers, Inc., New York, which constructed the foundations and piers of the east approach structures to both bridges and did the grading of the east and west approach embankments to the passenger bridge. The concrete deck slab on both of the bridges was constructed and placed by Frederic Snare, Inc., New York.

N. & W. Yields Ideas in Stores Work

SHOP orders, rivet handling and oil barrels are small and prosaic features of the railway business, but not inconsequential if they involve expense or offer the means of reducing it. The methods which have been developed by the Norfolk & Western have been tested by several years' operation, and appear to possess a degree of utility and dependability much in demand in stores management.

All shop orders are issued by a shop order clerk in cards measuring 5 in. wide and 8 in. long and printed in three colors—a buff color for ordinary work, a red color for emergency work, and a yellow color to designate orders placed for new equipment or for work requiring special authority. Since the purpose of the yellow card is to guard against mistakes in making charges for A. F. E. work, the letter "X" is inserted opposite the order number on the yellow card as a further precaution against mistakes in charges.

Besides identifying the material in accordance with a standardized specification, each card, regardless of color, carries an order number, an entry number, a series number, a drawing or pattern number, the date of the order, the quantity ordered, and the number of the requisition or other authority. It also shows the person to whom the material is to be shipped and a catalog and classification number to facilitate identification at destination. It also shows the department for which copies of the order have been made and carries blank spaces for noting the kind of material, the weight, the date of completion, the date of shipment, and the receiver.

All cards are filled out in the stores by typing the office form with copying ink and reproducing the data on the required number of cards by ditto process, which affords flexibility in the number of copies, saves time, avoids copying errors and assures legibility.

Multiple Copies

The number of copies depends upon the material and the department concerned. In the case of rough castings, three copies are prepared for the foundry, one of which goes to the pattern shop, another to the foundry office, and the third to the foundry shipping department. If two or more departments are concerned, the originating department takes a receipt from the finishing department and returns its card to the shop order clerk who marks it so that he can keep in touch with the progress of the work. When the finishing department delivers the material to the stores department, it surrenders its card and the shop order clerk marks the order closed and forwards the card to the office of the superintendent of shops where the shop accounting is done. The general storekeeper is billed with the cost of production and the charges are carried in a material and supply account until material is shipped to user.

Numbering and Accounting

The numbering depends on whether the orders are standing or special orders. Standing orders cover materials which are commonly used and for which an average cost is satisfactory for pricing. There are 102

Form G. S. 73

Norfolk and Western Railway Company
Roanoke Shop Work Order

Order 524
Entry 4398 - 93
Series 105
Drawing

Date /9/31 Quantity

Sec. Item Req. ECK 326 Auth.

Pattern

Ship to Sk. East Radford, Va.

Specification

50 Pcs. Pine running boards,
1-1/8 in. x 5-3/4 in. x 19 ft. 6 in. long.

20 Pcs. dressed pine , 3 in. x 10 in. x 12 ft. long.

COPIES AS INDICATED

Supt. Shops		Pipe and Tin	
G. S. K.		Foundry	
Storekeeper	2	Passenger	
Val. Bureau	1	Freight	
Electric		Paint	
Frog		Planing Mill	2
Machine		Wheel	
Smith		Yard	
Erecting		Shop Inspector	
Boiler		Supt. Car Dept.	1

Kind Material Gross Wt. Net Wt.

Date Completed Date Shipped Rec'd by

A Typical Shop Work Order Form

standing orders, one order, for example, covering the manufacture of any cast-steel rough castings, another order, cast iron rough castings, a third order, bronze and brass castings, etc. Standing order accounts are kept on a monthly basis and a six-months' average cost is found for use in charging the cost of the material to the proper operating account. Special orders apply to material which is not commonly used and where the exact cost of production is desired. On all orders covering material of the same class, therefore, the same number is used, while the order numbers of all other material are consecutive. For purposes of filing, each order also carries an individual entry number.

To facilitate accounting, the office of the superintendent of shops receives a copy of each order placed for work not covered by standing orders, but the charges on standing orders, being prepared monthly, are taken from the individual time slips and require no advance copies of each order.

Oil-Drum Records

In operating the central oil-house at Roanoke, the Norfolk & Western has found a practical and inexpen-

(Continued on page 180)

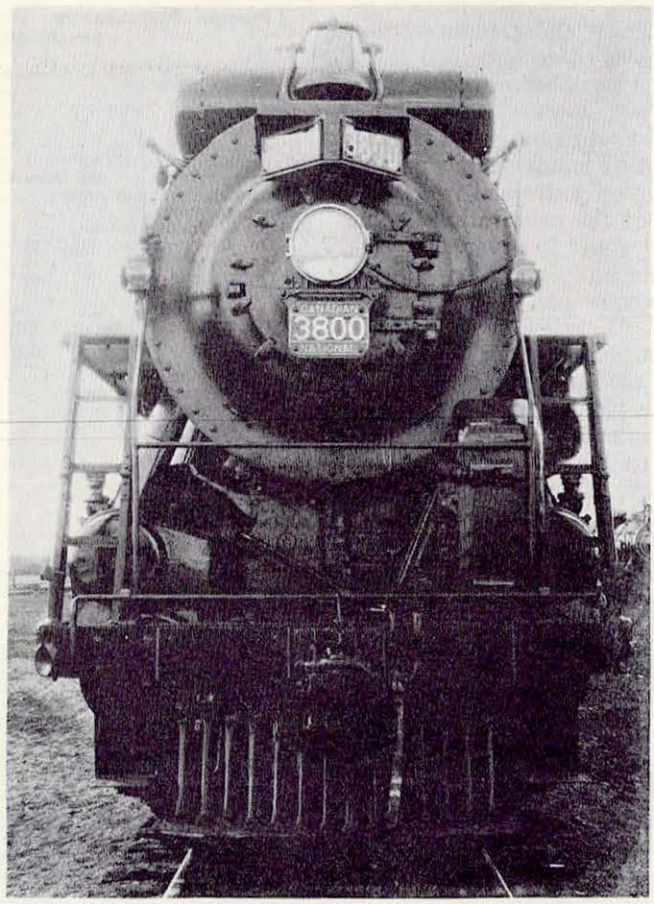
Locomotive Designed for Service on the Canadian Prairies

Canadian National sample 2-8-2 type makes good performance record in bad-water territory—Satisfactory tests in fast-freight and in tonnage service

ON the Western Region of the Canadian National in the prairie provinces, operating conditions are encountered which render locomotive maintenance costly, due primarily to the poor quality of feedwater available. When new freight power was being considered for this region, it was decided to build a sample locomotive in which features were embodied that would tend to relieve these conditions.

Most of the difficulties experienced have been due to sludge and boiler sediment being carried over by the steam flow into the superheater units and cylinders, and by the burning out of firebox sheets.

A locomotive, to meet the above conditions, must provide some method of collecting and conveying steam to the cylinders different from that usually employed, must have a relatively slow rate of combustion, high boiler capacity and steam distribution of a nature such that full capacity can be developed without unduly forcing the machine as a whole.



Front View of the Canadian National 2-8-2 Type Locomotive

With these conditions in view, the company designed and built at its Point St. Charles shops, Montreal, Que., locomotive No. 3800, Class S-4-a, and, on completion in the early fall of 1930, placed it in service on the Central Region for observation and test between Danforth, Ont., and Sarnia, Ont., in fast-freight service and, later, between Danforth and Fort Erie, Ont., in heavy coal service. Under both classes of operation the locomotive has demonstrated its ability to perform in a satisfactory manner and considerable valuable experience is being gained for incorporation in further designs at a future date. Several minor alterations have been made to the original design as the result of the preliminary test runs.

The No. 3800 exerts a tractive force of 56,200 lb. It has 24-in. by 30-in. cylinders and operates at a boiler pressure of 265 lb. The driving wheels are 63 in. in diameter. The locomotive weighs 337,200 lb., of which 237,000 lb. is carried on the drivers.

In accordance with the requirements referred to in the preceding paragraphs, the dome and inside dry pipe have been omitted from the boiler and an outside dry pipe of somewhat novel design introduced in their stead. On the top center line of the boiler at suitable intervals three 5½-in. holes are cut to provide an outlet for the steam. Over these openings are riveted cast-steel saddles, consisting of a base and a cylindrical body portion, the forward two of which are open at both ends, while the rear is open on one end only. The other end is cored and faced for a ball joint. The collector pipe, a 10¾-in. seamless steel tube, is passed through the cylindrical saddles and bottomed on a faced joint on the inside of the solid head of the rear saddle. These saddles are of such shape that an annular passage is formed between the collector pipe and the cylindrical shell, terminating at the bottom or base portion in a hole which registers with one of the 5½-in. holes in the boiler shell. The open ends are faced and bored to a sliding fit for the pipe and made steam tight by means of electric welding around the outside faces of the saddles and the collector pipe.

Around the periphery of the collector pipe at the portion covered by each of the saddles are drilled five rows of ⅝-in. holes, 20 in each row, making a total of 100 ⅝-in. holes, to conduct the steam from the 5½-in. boiler outlets to the interior of the collector pipe. The forward end of this pipe is swedged down to receive an 8-in. outside diameter seamless steel dry pipe which is securely welded at its rear end to the swedged portion of the collector. The dry pipe terminates at the smokebox end in a steel flange which is welded to the pipe and faced for a ball-joint connection to the shut-off valve. A cast-steel L-shaped shut-off valve body, provided with ball-joint flanges, passes through an opening in the smokebox immediately in front of the cir-

cumferential seam, the vertical leg of which connects with a horizontal flange on the superheater header, while the horizontal leg is fitted to the dry-pipe flange. The shut-off valve, a flat disk of plate bored in the center to form a seat for the balancing valve and actuated by an Acme threaded screw, the initial movement of which unseats the balancing valve, has its seat on a forged-steel ring pressed into a suitable recess at the top of the vertical leg of the shut-off valve body. Faced lugs on the sides of the valve body are fastened by suitable anchor plates secured to the smokebox shell to relieve the body casting and dry pipe of any end thrust due to steam pressure.

Inside the boiler, immediately under the outlet openings, a shallow box of ¼-in. plate is tightly fitted to the shell and held in place by studs. The bottom face of this box or pan is perforated over the greater portion of its length with 468 ⅝-in. holes of an extruded form, through which the steam must pass before having access to the outlet holes.

It was anticipated that, by spreading the steam-outlet area over a large extent of water surface in this way and baffling any sludge or entrained water by means of the extruded form of the perforations, some of the difficulties experienced could be overcome.

However, these expectations have not been entirely realized in service and the box or pan has since been altered.

In addition to the alteration made to the pan under the dry pipe and changing the feed pump, the front outlet hole in the boiler has been blanked off and the remaining two holes have been found of sufficient area to meet the steam requirements of the cylinders and auxiliaries in a satisfactory manner. While using the three openings, the locomotive showed a tendency to carry water and sediment into the dry pipe, especially during periods of surge such as follows a heavy brake application. Since the front opening was blanked, no further difficulty has been experienced and dry steam with a high degree of superheat is consistently maintained.

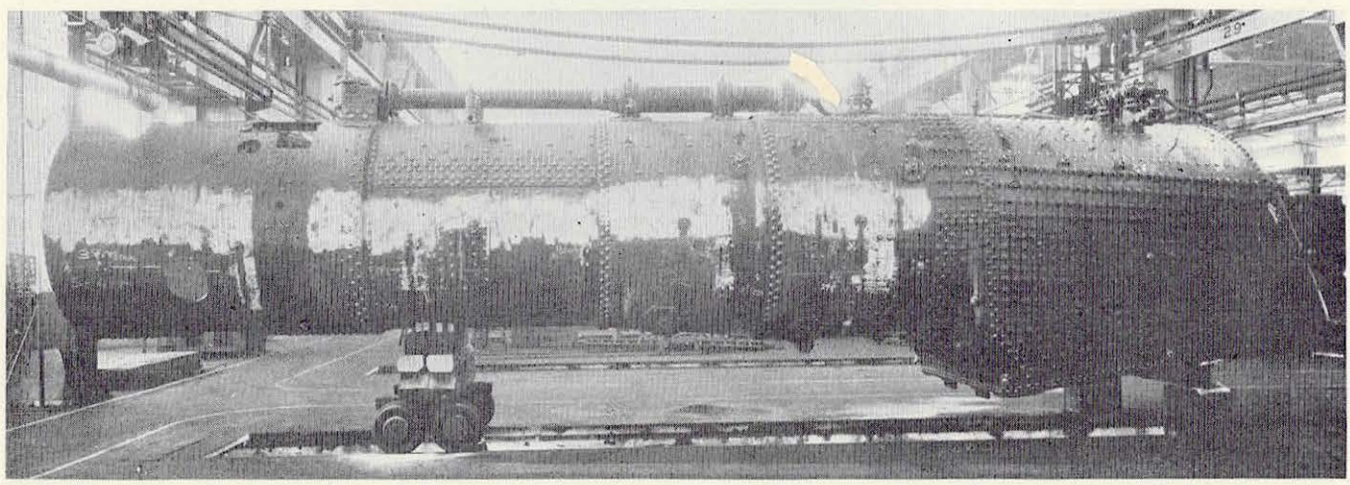
A 2½-in. iron pipe with flanged connections runs from the back end of the rear collector saddle to the cab turret on the right side. This pipe supplies saturated steam to a number of auxiliaries. The superheated-steam turret connects to a 2½-in. pipe which is carried along the top of the running board on the left side to a cast-steel auxiliary steam-pipe elbow passing through the smokebox near the top and connected directly to the superheater header.

A 13-in. by 15-in. manhole provides access to the interior of the boiler. This manhole is located on the top center line at the rear of the collector saddles and is closed by a cast-steel cover into which the safety valves are screwed. The dry pipe, collector pipe and saddles are lagged and jacketed and an external inverted U-shaped casing is fitted from the stop valve at the smokebox over the entire length of the boiler to the cab-turret casing. The sand box is made in two halves straddling the collector saddles, and the U-shaped casing is fitted into it at the front and back faces, and into the cab turret casing, forming an unbroken outline from the front to the rear of the boiler.

Feedwater enters the boiler on the top center line of first course directly beneath the dry pipe. A small steel casting, with inlets at an angle of approximately 30 deg. on each side and tapped to receive 2-in. iron pipe, is riveted to the boiler. Short lengths of double-

Principal Dimensions and Weights of the Canadian National Sample 2-8-2 Locomotive

Railroad	Canadian National
Builder	Canadian National (Pt. St. Charles shops)
Road class	S-4-a
Service	Freight
Rated maximum tractive force	56,200 lb.
Weight on drivers ÷ max. tractive force	4.21
Cylinders, diameter and stroke	24 in. by 30 in.
Valve gear, type	Baker
Weights in working order:	
On drivers	237,000 lb.
On front truck	39,000 lb.
On trailing truck	61,200 lb.
Total engine	337,200 lb.
Tender	272,300 lb.
Total engine and tender	609,500 lb.
Wheel bases:	
Driving	16 ft. 9 in.
Total engine	37 ft. 8 in.
Total engine and tender	76 ft. 3¾ in.
Wheels, diameter outside tires:	
Driving	63 in.
Front truck	31¼ in.
Trailing truck	43 in.
Boiler:	
Steam pressure	265 lb.
Fuel, kind	Bituminous
Diameter, first ring, inside	80⅞ in.
Firebox, length and width	120⅛ in. by 84¼ in.
Tubes, number and diameter	42—2¼ in.
Flues, number and diameter	167—3½ in.
Length over tube sheets	17 ft. 4 in.
Grate area	70.28 sq. ft.
Heating surfaces:	
Firebox and combustion chamber	339 sq. ft.
Tubes and flues	3,065 sq. ft.
Total evaporative	3,404 sq. ft.
Superheating surface	1,591 sq. ft.
Combined evap. and superheat	4,995 sq. ft.
Tender:	
Water capacity	11,000 Imp. gal. (13,200 U. S. gal.)
Fuel capacity	20 tons.



Boiler of the Canadian National 2-8-2 Type Locomotive Designed for Service in Bad-Water Territory

extra-heavy pipe, screwed and welded, join these inlets with cast-steel flanged elbows which extend beyond the U-shaped casing and serve to attach the right- and left-hand boiler-check valves.

Silicon steel is used throughout in the construction of the boiler shell, with the exception of the welt strap of the third course, from which the manhole is flanged and where ordinary open-hearth boiler steel is used.

Boiler Accessories

A Type E superheater with multiple throttle header is applied. The firebox, of liberal grate area, is fitted with two Nicholson Thermic syphons and two 3-in. outside

Canadian National 2-8-2 Type Locomotive Built for Freight Service on the Western Region

diameter arch tubes and a 23½-in. combustion chamber. The somewhat limited tube length imposed restrictions at this point. The net firebox volume, after deducting the arch, syphons and arch tubes, is 361.25 cu. ft. Canadian National standard round-hole grate bars are used, which provide a free air opening of 11.8 per cent. An ashpan of moderate slope and ample capacity, fitted with Canadian National standard cast-steel hoppers and swinging doors, a type BK stoker, Franklin single-cylinder grate shaker and Franklin fire door, an Elesco feedwater heater and Superior automatic soot blowers complete the boiler and auxiliaries.

Originally an Elesco centrifugal pump was fitted, but since going into service this pump has been replaced by a type CF-1 Elesco pump, which is supported on the same bracket cast on the left side of the cradle, below the ashpan, which was for the centrifugal pump. An H.N.L. injector is located on the right side.

The cut-off is limited to 64.8 per cent on the main ports, while on the auxiliary ports it is 83 per cent. An additional five per cent compensating cut-off is provided on the head end of each cylinder by a slight enlargement of three ports, still further improving the starting torque, and, with a factor of adhesion of 4.21, the locomotive showing little tendency to slip. The 14-in. piston valves are actuated by a Baker long-travel, long-lap type of valve gear.

Frames and Running Gear

The main frames are nickel cast steel and the cylinders and steam pipes are nickel cast iron. The main and side rods are nickel steel. The main crank pins and axles are of Steel, Peech & Tozer quenched steel. The single guide bar is of nitrided alloy steel and forced lubrication is supplied to this detail, as well as to the valves and cylinders, by a Nathan D.V.S. lubricator on the right side.

The engine truck has outside bearings and provides 40 per cent constant resistance, while the trailing truck is the Delta outside bearing with 20 per cent constant resistance, both of General Steel Castings Corporation manufacture. The engine and trailing truck and the main driving journals are fitted with Canadian National standard revolving-bushing boxes.

Tenders of Unique Construction

The tender of this locomotive is of interest, being an improved design of the Canadian National standard frameless Vanderbilt tank, first introduced on a number of 4-8-4 locomotives built in 1929. The later design used on the No. 3800 was also applied behind 4-8-2 engines built during 1930.

The Canadian National now has in service, or in the course of construction, more than 50 tenders of this same general arrangement. No underframe is employed. The bottom tank plate of 1-in. thickness forms the backbone to which the draw and center castings are riveted and welded. The internal bracing is of such a nature as to add substantially to the rigidity of the bottom structure. Tenders of this general design in service over a period of practically 2½ years have rendered satisfactory service. They have proved their ability to withstand the shock of collision and, although the body plates were ruptured, the under structure was found to be intact.

In the latter design, as used on the No. 3800, considerable lightening in weight, mainly in the castings, was effected and the compartment for housing the stoker engine was relocated. This compartment is now placed directly in the rear of the conveyor. The engine is carried on a cast-steel base plate and is connected to the conveyor gear shaft without using the customary shaft and universal joints. Only one joint is required for alinement purposes, making a more compact connection. Access is had to the compartment by means of a casing which passes out through the side of the tank and is fitted with a hinged door. The design of the vestibule diaphragm spring equipment has been modified and the diaphragm is now of all-welded plate construction. The rear bumper beam of cast steel has been eliminated and a structural steel platform of a design suitable for jacking has been substituted. The locomotive cab is also of welded construction.

Miscellaneous Equipment

A new style of coal gate has been fitted to the bunker of the No. 3800 and is giving satisfactory service. The customary construction using four or more leaves has been replaced by a single flat-hinged door. This door provides access to the coal space, and a small door of semi-cylindrical shape revolving on trunnions furnishes the necessary opening for hand-firing or adjusting stoker slides. Peep holes covered by small pivoted slides are provided so that a bar may be inserted to break down any arching of the coal before it is off the entrance gate.

The front tank plate is not cut away to the same extent as before and can be substantially braced. Six-wheel General Steel Castings Corporation trucks with clasp brakes are applied.

One 8½-in. Westinghouse cross-compound air compressor is applied at the front end on the left side of the locomotive and is supported on a cast-steel bracket, carried from the frame and engine truck center-pin guide. A plate shield is fitted in front, as shown in one of the illustrations. The pump throttle is located on the auxiliary steam-pipe elbow at the left side of the smokebox. It uses superheated steam and is opened and closed by enginehouse forces. The whistle is attached at the same point and is operated by a cable through the left handrail.

The tender brake equipment is somewhat modified, an 18-in. brake cylinder with Type L triple and double chock valve being employed. The by-pass feature is inoperative and the triple functions in lieu of a brake-pipe vent valve. This arrangement is standard on most of the Canadian National heavy power.

Precision power reverse gear, Franklin safety bar and side-spring radial buffer of a special design to suit Canadian National clearance requirements are applied. An Elesco trap is fitted in the tender tank, the condensate and stoker exhaust being piped into it. Practically all iron piping on the engine and tender is welded, thus eliminating as many sources of leakage as possible.

Freight Car Loading

WASHINGTON, D. C.

REVENUE freight car loading in the week ended July 18 amounted to 757,555 cars, a decrease of 6,026 cars as compared with the week before, of 170,716 cars as compared with the corresponding week of last year, and of 322,413 cars as compared with the same week of 1929. Loadings of grain and grain products, forest products, ore and live stock all showed increases as compared with last week, but decreases as compared with corresponding weeks in 1930 and 1929.

All districts reported reductions in the total loading of all commodities, as compared with the same weeks in the two preceding years. The summary, as compiled by the Car Service Division of the American Railway Association, is as follows:

Revenue Freight Car Loading

Week Ended Saturday, July 18, 1931

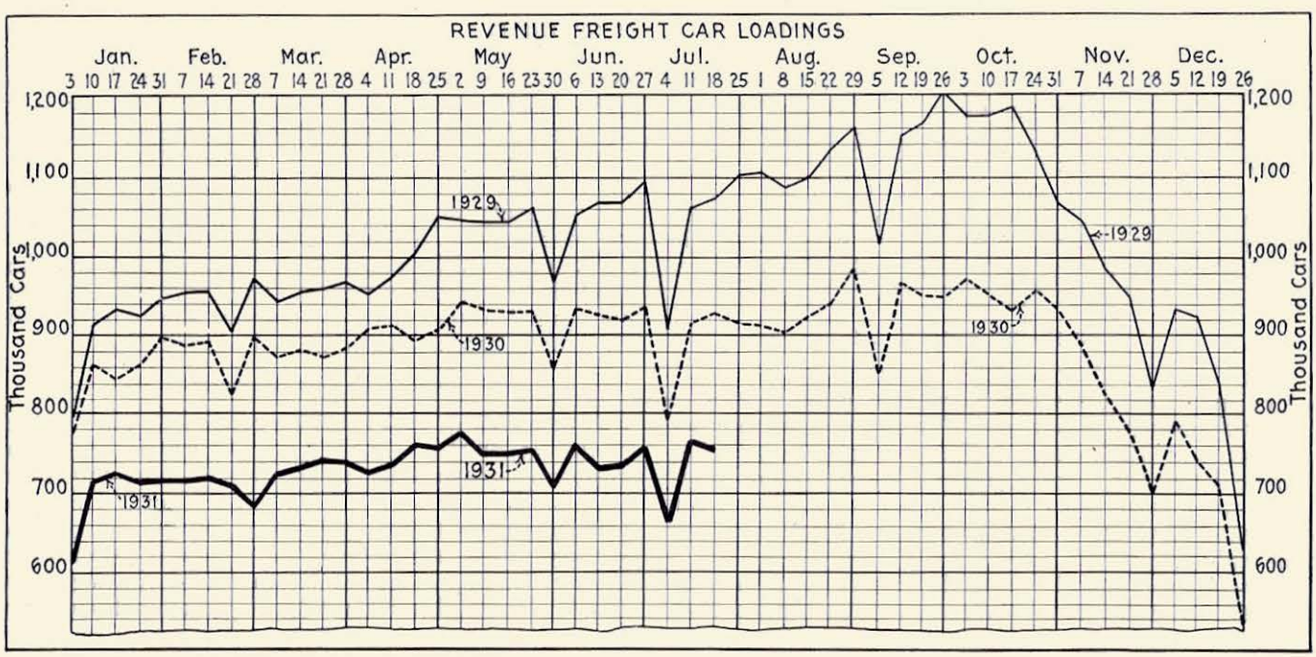
Districts	1931	1930	1929
Eastern	169,494	205,642	242,197
Allegheny	142,860	188,812	221,576
Pocahontas	47,002	53,853	60,446
Southern	103,413	117,848	138,109
Northwestern	107,104	144,512	173,462
Central Western	123,346	142,934	162,338
Southwestern	64,336	74,670	81,840
Total Western Districts	294,786	362,116	417,640
Total All Roads	757,555	928,271	1,079,968
Commodities			
Grain and Grain Products	60,127	64,155	64,733
Live Stock	19,710	22,351	22,861
Coal	109,144	136,805	151,219
Coke	4,548	8,530	11,883
Forest Products	27,891	42,165	66,743
Ore	36,900	62,009	79,348
Mdse. L.C.L.	213,294	233,173	257,570
Miscellaneous	285,941	359,083	425,611
July 18	757,555	928,271	1,079,968
July 11	763,581	915,985	1,066,414
July 4	667,879	792,053	911,143
June 27	759,290	936,690	1,096,569
June 20	739,116	920,645	1,069,874
Cumulative total, 29 weeks	21,168,999	25,836,885	28,674,478

Car Loading in Canada

Revenue car loadings at stations in Canada for the week ended July 18 totaled 47,966 cars, an increase over the previous week of 201 cars but a decrease of 13,099 cars from the same week last year.

	Total Cars Loaded	Total Cars Rec'd from Connections
Total for Canada		
July 18, 1931	47,966	22,311
July 11, 1931	47,765	20,828
July 4, 1931	43,545	24,179
July 19, 1930	61,065	29,813
Cumulative Totals for Canada		
July 18, 1931	1,397,032	787,281
July 19, 1930	1,707,897	1,005,685
July 20, 1929	1,914,523	1,219,068

THE CHICAGO & NORTH WESTERN has recently moved the New York City offices of its freight and passenger departments from 475 Fifth avenue to 500 Fifth avenue.



Problems of the Superintendent

Fuel performance and dispatchers' qualifications considered at recent convention

Part IV

AMONG the reports presented at the convention of the American Association of Railroad Superintendents at St. Louis, Mo., on June 9-12, were one outlining the qualifications of a chief dispatcher and another setting forth those phases of fuel conservation which come within the influence of the division superintendent. These reports, which are abstracted below, supplement the general report of the convention which appeared in the issue of June 20, abstracts of four reports and papers which appeared in the issue of July 4, pages 17-20, and abstracts of two additional reports which appeared in the issue of July 18, pages 91-4. Abstracts of other reports and papers will appear in a succeeding issue.

The Qualifications of a Chief Dispatcher

The report of a special committee of chief dispatchers, of which E. M. Price, night chief dispatcher, N. P. Seattle, Wash., was chairman, discussed the chief dispatcher's functions in expediting train movement. The report said in part:

A general manager said, when asked for his idea concerning the function of a chief dispatcher in expediting train movement: "You have in your charge the spending of more of the railroads' money than anyone else on the road, and your individual chances of success depend upon the judgment used in spending that money."

Careful dispatching in ordering and spacing trains and planning to eliminate train stops and delays will increase gross ton miles per train-hour just as surely as larger power will. Money in large amounts will be saved for the railroad if the chief dispatcher will in every case possible carefully consider the yards, roundhouses, adjoining divisions, and last but not least, the track and bridge men in his ordering of trains.

Many stops can be avoided by the careful handling of short set-outs and pick-ups. A reasonable amount of back haul to move cars to a point where they can be handled back to destination by locals or by trains moving in the direction of light tonnage is preferable to the stopping of through tonnage trains. Too much cannot be said of the necessity for the closest co-operation between the chief dispatchers, yardmasters, roundhouse foremen, roadmasters, supervisors and neighboring chief dispatchers.

The system of handling trains by written train orders is an example of costly obsolescence. Imagine in the present day the superannuated system which requires a heavy freight train, a fast passenger train, or any train for that matter, to stop to sign an order, only to proceed to following stations to act upon the order. The signal companies, with their inventiveness, have made the train order obsolete and it is to be hoped that their same inventiveness will further reduce the cost of a system of handling trains by signal indication and of handling switches by remote control.

Standing instructions and standard practices are subjects concerning which one should have a thorough knowledge, but many of them are ancient. In the present day of rapidly changing conditions, most of them are obsolete after a season, or possibly after a few days.

The chief dispatcher must keep abreast of new developments in all branches of the railroad business. He will find time to read the standard railroad periodicals and make an occasional study of different departments of the business. He will analyze the reports of revenues and expenses and the operating statistics of his own road, and also those of his competitors and of outstandingly successful roads. One old-time chief dispatcher summed up the matter of statistics in the phrase: "Keep your tonnage up and your overtime down."

The chief dispatcher of today will compile simple, up to the minute reports or charts to keep himself fully posted as to what he is accomplishing, to interest his force, and to show his officers what a good job of transportation he is conducting. A report is worthless where some action cannot be taken upon it by someone.

Fuel Performance

A committee of which H. C. Rochester, office assistant to the vice-president, C. N. R., Montreal, Que., was chairman, considered fuel performance, fuel saving, the economic use of fuel on road and switching locomotives, and the economies of hand fired power plants, from the standpoint of the operating officer. The committee's report, which comprised a most thorough presentation of the subject, emphasized that in all factors affecting fuel consumption, the engineman and fireman exert the greatest influence. Their work can spoil or render ineffective the most efficient design of locomotive or the best grade of coal. One feature that requires special consideration now is the fact that many enginemen who have not handled a scoop for years have been set back to firemen and these men must now be trained in the methods of firing that produce the best results with the modern locomotive.

52 Ways for Saving

The committee suggested 52 ways in which additional savings in fuel may be effected. They are:

1. The proper assignment of locomotives to the various types of trains and varied physical features of the territory.

2. Extension of locomotive runs. The dumping and lighting of a modern locomotive requires the consumption of approximately one ton of coal.

3. The importance of fuel consumed by yard locomotives is apparent from the fact that at times upwards of 20 per cent of

locomotive fuel is chargeable to yard operation; therefore, efforts should be directed to see that the movements of all cars are continuous in their proper direction, and that they receive the minimum number of handlings between arrival and departure in yards.

4. Installation of facilities for hump switching when justified by traffic conditions.

5. Avoidance of road and terminal delays. It is estimated that a modern freight locomotive will burn from 6 to 9 lb. of coal per minute while standing.

6. Avoidance of stops of through trains that careful investigation indicates can be eliminated. It is estimated that the starting and stopping of a tonnage train consumes from 300 to 1,800 lb. of coal, depending on the load and grade conditions.

7. Elimination of water stops at the foot of grades.

8. Installation of spring switches at the ends of double track to avoid stopping trains to open and close switches.

9. Installation of improved signals, interlocking plants and remote controlled switches at important passing tracks.

10. Elimination of the operation of signals to stop heavy trains in awkward places.

11. Avoidance by dispatchers and operators of stopping trains for orders by the use of "19" orders instead of "31" orders, where permissible.

12. Giving adjoining divisions reliable advice of arrival times of through trains in order to minimize the time of locomotives standing in yards waiting for connections.

13. Ample tender capacity to reduce the number of stops for water and fuel.

14. Training of trackmen to avoid stopping trains, in so far as possible.

15. Removal of slow orders as quickly as conditions permit.

16. Speeding station work of passenger trains to avoid delays, with the consequent necessity for running faster than scheduled to make up time, with the resultant excessive use of fuel.

17. Establishment of and adherence to the most efficient tonnage ratings for the various classes of locomotives for the varied classes of traffic to be handled over each portion of our respective railroads. Fuel consumption considered in terms of gross ton miles per pound of coal indicates a very close relationship between fuel economy and economical train loading.

18. Heavier loading of cars. On a level grade, at a speed of 20 miles an hour, 460 lb. of tractive effort is required to handle 50 tons in two cars of 21 tons weight. Only 270 lb. of tractive effort is required to haul 50 tons in one car of the same weight. The hauling of the same car and contents at 40 miles an hour increases the traction by 53 per cent.

19. Avoidance of back-hauling and cross-hauling of cars.

20. Reduction of the consist of passenger trains as promptly as traffic conditions permit.

21. Permitting freight trains to increase speed for momentum even up to about 45 miles per hour approaching grades where track and other conditions permit.

22. Keeping way freights and pick up trains out of the way of tonnage trains.

23. Maintenance of track in proper alignment and surface, free from low joints.

24. Study the characteristics of the coals that are available for purchase, which by force of circumstances have to be used, with the aim of securing as good coal as is possible, considering the advisability of low moisture and ash content, grading for sizes, etc.

25. Fuel should be of uniform grade on each subdivision in order that enginemen may learn by experience the best method of applying it to produce the most satisfactory results.

26. Careful inspection and testing of coal and oil purchased, to insure good quality.

27. Avoidance of mixing non-combustible matter with coal. This may cause more than a mere waste of fuel.

28. Providing cars for coal loading that are suitably cleaned and free from foreign substances as well as deteriorated or slack coal.

29. Proper trimming of cars loaded at mines or coal dumps to avoid loss of coal in transit.

30. Proper reporting of coal found to be unsatisfactory.

31. Proper unloading of fuel at coal chutes and other places of storage with consideration of the purposes for which it is to be used, and the careful selection of ground on which to unload coal that is to be stored.

32. Proper loading of coal from storage to avoid picking up earth, gravel, stones, metal, etc.

33. Avoidance of overloading of tenders, permitting coal to fall to the ground to be wasted.

34. Location of coal, oil and water stations at convenient points to reduce loss of time in running to and from such locations. The construction of main line fueling plants facilitates the operation of locomotives on long runs.

35. Survey all coaling facilities to decide whether there is justification for their continuance or for the substitution of more modern apparatus, better located to suit present day operating conditions.

36. Frequent and intelligent check of coaling plants may indicate conditions that result in coal being broken up unnecessarily in the process of delivery to tenders or there may be conditions that cause separation of large and small coal, resulting in some tenders getting the large coal and others getting all the slack.

37. Survey stoves used in stations and cabooses to see if they are as efficient as can consistently be obtained. On one railroad the adoption of a scientifically designed caboose stove in lieu of the type formerly employed resulted in saving approximately 50 lb. of coal per trip during winter weather.

38. Exertion on the part of locomotive foremen and others to prevent locomotive failures.

39. Taking of steps by car department officers to keep equipment in good condition, to reduce hot boxes and delays due to other equipment failures.

40. Careful attention to all air brake apparatus to see that leaks are reduced to the lowest possible minimum, and that all brake connections on engines, cars and cabooses are tight.

41. Avoidance of excessive shocks in switching that result in loosened brake pipe and cylinder connections.

42. Allowance of ample time to inspect air brakes properly and place them in good working order before leaving terminals.

43. Equipment of yard air brake charging systems with pipe leading to outbound tracks to charge all outgoing trains with air before locomotive is attached.

44. Stretch slack of freight trains for more satisfactory inspection by car inspectors.

45. Avoidance of firing up locomotives too long in advance of the time required for use.

46. Proper treatment of water where treatment is of benefit to the steaming qualities of locomotives.

47. Storing of all passenger, freight and switching locomotives that can be spared, to avoid their consumption of fuel and to permit shop forces to concentrate on the remaining engines kept in service.

48. Direct steaming of locomotives in engine houses.

49. Provision for passing tracks of sufficient length, conveniently spaced.

50. Double track naturally facilitates the movement of trains with consequent possibilities of low fuel consumption, but the construction of additional tracks involves heavy capital expenditures.

51. Centralized traffic control greatly facilitates the movement of trains over single track lines with a minimum of stops, and is often justified on heavy traffic sections of single track lines.

52. The substitution of rail motor car service for steam service where practicable. Many railroads find economy in operating rail motor cars propelled by gasoline electric power plants, Diesel electric plants, electricity from storage batteries, direct drive gasoline engines, etc., on runs where the traffic handled is sufficiently light to be accommodated in such self-propelled cars, with or without trailers.

Weighing and Recording Coal Used

The committee recommended careful consideration of the weighing of the coal supplied to each locomotive at each coaling station to permit the compilation of accurate reports of fuel consumption. All other supplies used on a railroad are very carefully measured in distribution, and supplied only on detailed requisitions.

Under existing conditions one locomotive is charged with coal that is used by another, and locomotives are often charged with coal that is supplied to stations and cabooses, coal that is dropped off cars, etc. The weighing of the coal supplied to each engine at each coal chute would permit the preparation of definite reports of the consumption by each locomotive and by each fireman, in many instances, with substantial benefit for comparative purposes, indicating the wasteful fireman who should be given additional instruction and supervision in firing methods, and the locomotives that can with benefit receive adjustments in their drafting and valve setting. Under existing conditions when a superintend-

ent finds his transportation accounts charged with increased expenses for fuel, in the absence of proper detailed information, he is often unable definitely to place the responsibility where it belongs.

It is understood that this recommendation may involve certain additional capital expenditures for the installation of scales or other devices, and further expenses for the preparation of reports, but there are so many apparent advantages from a fuel economy standpoint, and the fuel cost in the operation of most railroads is so great, that it is considered worthy of serious study by the officers of each railroad. Such a system should permit the establishment of better means for distribution of the costs of fuel. For instance, it is considered that much of the fuel used in work train engine service is now charged against transportation.

The preparation of detailed reports would permit much closer supervision over the operation of each engine and engine crew, would provide a more ready guide to wasteful operating practices and would permit the conduct of contests between the engine crews on a division and between the officers and employees on various divisions, which should substantially assist in reducing the fuel bill. A daily record would be of substantial benefit in permitting each road foreman of engines to locate quickly any single case of excessive use of fuel. In other words, transportation officers are now handicapped by being forced to deal only in generalities, and should have specific data in connection with this most important feature of railroad operating cost.

Hand-Fired Power Plants

In dealing with this phase of the subject perhaps the paramount question one might ask is "Why are they hand-fired?" In this modern age of mechanical efficiency when a reliable device is available automatically to fire and control the pressure and temperature of all coal-burning units from a home heating boiler to the largest industrial plant, it is difficult to justify hand-firing except for very small furnaces.

Instruction of firemen in proper methods of firing should conserve the use of coal, but the committee's recommendation in this regard is that careful consideration should be given to all hand-fired power plants with a view to determining whether they could be operated more economically by the installation of stokers or by forced draft systems thermostatically controlled. Both of these systems generally permit the use of cheaper grades of coal.

The committee also strongly recommends the consideration of abolishing the use of power plants during summer weather or during the entire year by installing electric motors or Diesel engines to drive machinery or mechanical apparatus. When steam is not required for heating purposes, boilers may be discontinued if electric or other drive is provided; and where steam is required for heating, it may be possible to reduce pressure to a point where it is not necessary to have expensive certificated stationary engineers to operate boilers.

One railroad has recently substituted two 1,000-hp. boilers burning pulverized coal for 15 hand-fired boilers, and effected thereby a saving of approximately $100,000 per year. Another railroad reports that where electric drives for machinery have been adopted there have been savings of from 56 to 92 per cent per year of the cost of the new installations.

In connection with power plants that provide steam for heating several buildings, outlying coach tracks and other facilities, it is recommended that careful attention be given to the proper maintenance of effective insulation of pipelines to avoid the loss of heat and consequent extra use of coal.

Progress Made in Saving Fuel

Fuel savings already effected on the Class I railroads of the United States during the last few years are indicated by the following figures:

Year	Freight Service Pounds Per 1000 G.t.m.	Passenger Service Pounds Per Car Mile	Yard Service Pounds Per Loco. Mile
1921	162	17.7	138
1922	163	17.9	137
1923	161	18.0	141
1924	149	17.0	139
1925	140	16.1	137
1926	137	15.8	137
1927	131	15.4	134
1928	127	15.0	132
1929	125	14.8	130

Discussion

This report aroused active discussion. Charles Burlingame (T. R. R. of St. Louis) criticized much of the coal received as falling short of specifications and urged closer inspection by the railroads prior to acceptance. He also cited recent trouble with smoke violation caused by the setting back of enginemen to firemen, necessitating the special instruction of these men in modern methods of firing.

F. O. Coleman (M. & St. L.) also reported trouble with the coal received until a special inspector was put on to check all fuel as loaded at the mines and with authority to reject any found unsatisfactory. Since this inspection was inaugurated a vast improvement has been effected.

Mr. Coleman also described the beneficial results that have followed the appointment at each terminal of committees composed of representatives of each department having anything to do with fuel, whose function it is to correct at once any bad practice which they note, without waiting for action at the monthly fuel-conservation meetings. By this means, fuel-saving activities are made continuous.

D. L. Forsythe (St. L.-S. F.) advocated the acceptance of coal with 25 to 30 per cent of slack for stoker-fired locomotives. He also emphasized the importance of the systematic blowing off of boilers as a fuel conservation measure, stating that on his road regular blow off points are scheduled for both freight and passenger locomotives. He described the practice of covering grates with paper before firing a locomotive to prevent the fine material from falling through the grate, having found as much as 600 lb. of coal being lost through this cause in starting a single fire.

C. J. Brown (M. P.) reported that when a train is delayed on his road on account of poor coal, this report is investigated immediately, even back to the mine if necessary, to determine the cause. Such investigations show that most complaints of this character are unfounded. He stated that most fuel waste today is caused by poor transportation methods, including improper train loading, poor dispatching, badly located sidings, etc.

A. F. Judd (I. G. N.) reported on the use of lignite as fuel, stating that it has been employed so satisfactorily that lignite-burning and oil-burning locomotives are used interchangeably in both freight and passenger service.

I. C. C. to Speed Up Rate Hearings

WASHINGTON, D. C.

THE Interstate Commerce Commission has replied to charges that its procedure is too slow and that it was failing to show a proper appreciation of the railroad financial emergency, by announcing a revised plan for hearings in the general rate advance case which will save at least four weeks as compared with the date originally set. Instead of on August 31 it will begin hearings for the presentation of evidence in opposition to the railroad application at Washington on August 10 and instead of holding hearings in other cities after the Washington hearing it will have hearings in eight other cities, some of them concurrently, the first beginning at Portland, Me., on August 4, and the last beginning at Chicago on August 31, to be followed by oral argument at Washington about 10 days after the close of the hearings. This would make it possible for a decision to be reached by about October 1, instead of not until near the end of the year.

This plan for speeding up and condensing the hearings in opposition was announced on July 23 in response to urgent requests made at the hearing which closed on July 21 by counsel for financial institutions largely interested in railroad bonds and by H. W. Bikle, of counsel for the railroads. The insurance and savings banks committee asked that the commission resume hearings at once with a view to a decision by September 1, saying that an increase by that time might be able to keep several important roads from having their securities stricken from the list of legal investments for trustees and savings banks. Mr. Bikle, more conservative, had only asked that the commission reduce the time allowed before the next hearing to ten days or two weeks with a view to concluding by August 30. After two and a half hours of argument on this question the commission, including several commissioners who had not participated in the hearings, went into conference on the question and Commissioners Meyer, Lewis and Lee and the three examiners especially assigned to the case worked out the program on the following day, which was announced July 23. The program as finally announced is in substantial compliance with Mr. Bikle's request.

Opposition to New Program

In making its announcement the commission said that "the applicants and those supporting the applications concluded the submission of their evidence in chief much sooner than had been anticipated. This makes it possible to begin the further hearings which are considered necessary at correspondingly earlier dates." The railroads had completed the introduction of their case in three days, while three days more were taken up with testimony of other witnesses in support of the application and cross-examination. Representatives of the shippers present, stating that they had been relying on the announcement that the next hearing would not begin until August 31, vigorously opposed any suggestion of advancing that date.

Significance was attached in some quarters to the understanding that the plan for moving the hearing forward was voted on by the full commission, especially as considerable hostility to the railroad application had been indicated by the questions asked by the commissioners who sat during the hearing.

It is believed that among the seven commissioners who were not present during the rate hearing are several who may be much less positive than Commissioner Eastman that the railroads are doing the wrong thing, as well as some inclined to attribute more meaning to Section 15a than Commissioner Meyer, who indicated by his questions and statements that that section contemplates a net railway income only as near to a fair return as may happen to result from rates prescribed by the commission as reasonable under the older parts of the interstate commerce act.

Schedule of Hearings

Hearings outside of Washington will be held at Portland, Me., on August 4, Portland, Ore., on August 12, San Francisco, August 17, Atlanta, August 17, Dallas on August 21, Salt Lake City on August 24, Kansas City on August 26 and Chicago on August 31. It is expected, the commission's notice said, that the eastern interests, except New England, will present their evidence at the Washington hearing scheduled to begin August 10. Printed briefs must be filed within ten days after the close of the hearings.

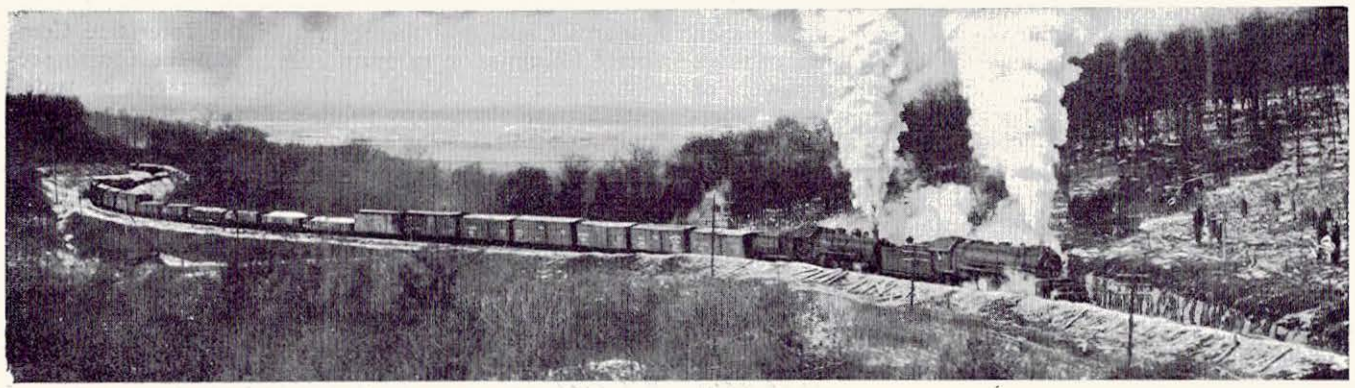
Stating that "the requests for time which have already been received exceed practical limits," the commission repeated what it had said in its notice of June 30 that evidence should "be presented as concisely as possible, using exhibits to curtail oral testimony," and that its committee of examiners is canvassing the requests for time and will endeavor to aid in arranging for the orderly presentation of testimony and the avoidance of cumulative evidence.

Evidence will not be received, the commission's notice stated, regarding treatment of individual railroads or minor groups of railroads and the level of railroad wages. Except for cross-examination relating to Exhibit No. 15, containing valuation studies made by the Bureau of Valuation, it was stated that "it should not be necessary to receive additional evidence on the subject of valuation." "Evidence relating to the method or methods of increasing rates, if an increase should be granted, should be confined as far as possible to typical illustrations. The same applies to evidence tending to show the effect of higher rates upon shipper and carrier," the notice said, and the commission invited the continued co-operation of all state commissions to these ends.

Commissioners Eastman and Porter have been added to Division 7, which was created to handle the hearings in this case.

Relation of Rate Case to Ex Parte 104

A declaration that the investigation announced by the commission on July 13 as Ex Parte 104 into "certain practices" of the railroads "affecting operating revenues and expenses" is entirely independent of the rate case, Ex Parte 103, was made by Secretary George B. McGinty of the commission in a letter addressed to T. M. Henderson of the Southern Traffic League, Nashville, Tenn. Mr. Henderson had telegraphed to the commission asking if the investigation which was announced two days before the rate hearings were begun, would be concluded prior to the decision in the rate advance case so that the facts developed could be considered in reaching conclusions in the rate case. To this Secretary McGinty replied: "Ex Parte 104 will doubtless be a continuing investigation. The commission will from time to time take up various matters for investigation as facilities and staff permit. It is entirely independent of Ex Parte 103."



Nashville, Chattanooga & St. Louis Fast Freight No. 54
Coming Over the Cumberland Mountains

Interests of Carriers and Shippers Are Inseparable*

Motor coaches and trucks, when economical, should be a permanent factor in transportation

By Silas H. Strawn

Chairman of the Board, Montgomery, Ward & Co., Chicago

THE thoughtful shippers of today realize full well that the railroads are the backbone of the transportation system of the nation. There is much discussion of the constantly increasing competition of inland waterways, airplanes, motor coaches and trucks, but no one can doubt that for many years to come the vast bulk of traffic must move by rail. The shippers appreciate the paramount importance of good railroad service and they know that such service cannot be rendered unless the railroads earn enough to attract private capital and efficient personnel.

On the other hand, intelligent railroad managers realize that they have nothing to sell but service; that they must do their work well and courteously, if they expect to retain the good will and patronage of their customers. The attitude of the railroads is reflected in the great improvements in service which have been made since the government returned the railroad properties to their owners in a badly demoralized condition.

Today only the demagogues who bait the railroads for their own aggrandizement remain without an understanding of the fundamental principles of transportation.

Railroad Legislation

Not only has the number of bodies to whom the railroads must answer greatly increased, but the scope of their power has also been continuously broadened. The keeping of accounts and accessory activities, the fixing of rates, including minimum rates, the issuance of securities, the abandonment and extension of lines, the use of safety appliances and train control devices and a variety of other functions are controlled by the Interstate Commerce Commission. What the federal boards do not supervise, the state commissions do. Practically all of this legislation has been restrictive rather than protective. It has limited the right of the railroad executives to conduct their business as would other business men.

The Transportation act was hailed as a very constructive piece of railroad legislation. Section 15a of that act, under which the railroads, in the aggregate, were to be given rates that would earn a fair return and the revolving fund established by recapture of excess earnings from which poor railroads were to be loaned money, were provisions supposed to be of great benefit to the railroads. Neither has been of any substantial value. The purpose of Section 15a has not been realized. Even in years of general prosperity, the railroads have failed to earn the fair return fixed by law. Nor has the revolving fund helped the weak roads.

When the public is made to realize that more economical and efficient transportation can be obtained by less governmental interference, the attitude of our lawmakers will change. Until the public has been so educated, and until politicians learn that baiting the railroads is not effective political propaganda we need expect no substantial change in the attitude of the congress and the state legislatures.

Not only can the shippers and the railroads render mutual service by preventing the further enactment of restrictive legislation, but they can also do much good by bringing about the repeal or modification of some of the existing laws.

Rate Making

Formerly, orders of the Interstate Commerce Commission fixing rates or the relationship of rates, remained in

* An abstract of an address made before the Traffic Club of Chicago on March 19.

effect for a period of only two years. At the end of that time the railroad executives were free to make such changes as their judgment might dictate. These changes were subject to check through the suspension powers of the commission. The tendency of that body was to follow the principle of stare decisis, but, to a considerable extent, the powers of initiative were restored to those responsible for the management of railroads.

In 1920 the two-year limitation was removed from the act. Now an order of the commission remains in full effect until rescinded or modified by another order. In these circumstances, if a railroad traffic manager wishes to change a rate once fixed by the commission, he finds his way obstructed by the necessity of preparing and filing a petition asking that the case be reopened, securing such a reopening, presenting evidence, filing briefs and going through the complicated and slow process of getting a new order from a busy and overburdened commission. The tendency of the commission is to refuse to reopen a case in the absence of a very strong showing of necessity therefor.

I do not criticize the commission, because that tribunal is doing a remarkably good job considering the tremendous volume of work it has to do; yet, the railroad executive is likely to find himself at a great disadvantage. If he succeeds in getting the case reopened and carried to a successful conclusion, the delay may have deprived the railroad of the benefit that it expected to get from a change in the rate and the shipper may also be deprived of the benefits from the proposed change.

Nearly every important rate or group of rates has at some time or other been passed upon by the commission. Every rate is a potential source of complaint. As time goes on and the commission fixes more and more rates, the power of the railroad properly to meet changing conditions is progressively diminished. Under the present practice it would seem only a matter of time until practically the whole rate structure of the country will be frozen. From this inflexibility both the railroads and the shippers suffer.

Fifteen or 20 years ago this serious situation was not immediately presented. Then rate litigation did not even approximate the volume it has reached today. At the present pace the day is not far off when the effects of depriving railroad managers of their powers of initiative and discretion with respect to rates, will become serious.

Overburdened by the great mass of work to be disposed of, the commission has been inclined to fix a more or less inflexible scale wherever possible. This is the easiest way out and under the circumstances existing today, the commission perhaps should not be too severely criticized for taking it. Nevertheless, it presents a serious danger to shippers as well as to railroads.

Any rigid rate scale must necessarily disregard economic conditions that would be given consideration by an intelligent traffic manager. Rates based upon theoretical principles instead of the practical needs of business are not likely to prove satisfactory to either shippers or railroads. This is especially true when the rates so established remain in effect until changed by further order of the commission.

These matters should be carefully studied by both shippers and railroads. Their interests are common. Congress could improve the situation in the interest of the shippers as well as the railroads, by modifying the law which provides that the orders of the commission shall remain in effect forever and a day.

Long and Short Haul Provision

Another law which has worked great hardship on railways and shippers of the middle west is the long and short haul provision of the Interstate Commerce act. Because of the cheap water transportation through the Panama Canal and the refusal of the Interstate Commerce Commission to grant relief from the fourth section, traffic destined to the Pacific Coast can be transported from almost any point east of Pittsburgh via rail and water at rates lower than the all-rail rates from the territory lying between the Alleghenies and the Rockies. The eastern shippers have thrived and grown prosperous on this coast trade at the expense of their Mississippi Valley competitors who are geographically much closer to the market.

The transcontinental lines were built primarily to handle Pacific Coast traffic. They have tried repeatedly to reduce their rates to the coast to meet the competition that exists without pulling down their rates to the intermediate mountain territory, but the Interstate Commerce Commission has refused to grant the necessary relief. The result is that these lines are compelled to move train after train of empty equipment westbound, in order to handle the eastbound business. This equipment could well be utilized in handling coast-bound commodities even at low rates, instead of representing a total transportation loss as it does today.

Nearly everyone believes that the political influence of the interested states has played its part in bringing about the denial of the relief which the transcontinental lines have so long sought. But in each instance the commission has based its decision upon some of the statutory conditions contained in the act. The latest reason assigned was the policy of fostering water transportation, announced in Section 500 of the Transportation act. This section should be repealed.

Economic laws, not those of Congress, should determine whether or not water transportation should be fostered. Likewise the specific limitations upon the commission's granting relief under Section 4 should be removed from the act, and the commission charged with entire responsibility for deciding when it should or should not be granted. The commission would then find it impossible to lay at the door of Congress the blame for its refusal to act where plain justice seems to require it.

Motor Transportation

The downward trend of the business cycle and the mass of restrictive legislation are not the sole causes of the present predicament of the railroads. New competitors have arisen in the form of motor coaches, trucks and airplanes, and plans are being constantly projected which will deprive them of further traffic.

The development of a national system of highways during the past decade has resulted in the widespread use of motor transportation as a substitute for travel by rail. Since 1920 passenger revenues alone have been cut almost in half. Of course, a large percentage of this decline is attributable to the operation of private vehicles, but the inroads of the motor coaches and trucks have been substantial. One of our western trunk lines estimates that trucks alone are depriving it of $5,500,000 of freight revenue a year.

I have no patience with the view held by some railroad men that motor coaches and trucks ought to be legislated off the highways. This cannot be done. If they furnish an efficient and economical mode of conveyance, if after all proper charges are made against them and after all reasonable regulations are imposed, a cheaper and more desirable service is rendered to the public, they should be accepted as a permanent factor in our transportation system. But they should be required to pay for the use of the highways that the states and municipalities furnish them. The public highway is just as much a part of their plant as the right of way is that of the railroad company. The coach or truck oper-

ator who uses a public facility for personal gain should pay his proportionate share of its cost and upkeep.

Motor trucks and coaches should also be, and in many states are, subject to police regulation to insure the safety of the public. If truck operation is economically sound it will survive in spite of restrictive legislation and the protest of the railroads; if it is not, it will expire because of its own weakness. In self defense, several railroads have established coach and truck service as an adjunct to their present facilities. The success of this policy has not yet been conclusively demonstrated. I have not the time to go into the topic. I may say in passing, however, that in Great Britain, the Royal Commission on Transportation has recently made a report in which it says that it does not think the policy of the railroad companies "getting on the road" themselves, that is, establishing road service, is wise, and suggests that the capital expended for that purpose might better be used in electrifying suburban service and in improving the speed and comfort of passenger trains for the short and moderate distance runs.

The Royal Commission opposes the building of any more "arterial highways" and lays down the principle that motors and trucks should pay their way and no more and concludes that two-thirds of the annual highway maintenance cost, estimated at $300,000,000, should be borne by the motorists and truck men and the rest by the taxpayers.

May I suggest to the shippers who have the choice of using trucks or the railroads, that, while the trucks may be immediately more economical or available than the railroads, ultimately this may be more than offset by the resultant increase in the cost of railroad transportation to which the use of trucks is not adapted.

Inland Waterways

Perhaps my railroad affiliations chill my enthusiasm for the development of inland waterways. I must approach the consideration of the construction of artificial waterways as an economic proposition rather than in response to political expediency. I submit that the construction of artificial waterways should proceed with caution.

Before the era of railroads many of the eastern states invested tremendous amounts of capital in the construction of canals. The greatest part of these public funds was subsequently lost. Today the federal and state governments are asked further to embark in a similar venture in utilizing and improving natural channels so that certain regions may be benefited by lowered shipping costs. If such a program is economically sound it should not be hampered, but first let us carefully consider its soundness. The fact is that the aggregate ultimate cost of transportation by inland waterways will not, at the present time at least, be less than that by rail. Governmental funds expended in construction and maintenance represent an integral part of cost. To permit a steamship or barge line company to use a waterway without bearing its just proportion of the cost of construction and maintenance is, in fact, subsidizing one industry at the direct expense of another. More inconsistent with the fundamental principles of our government, is a governmentally operated waterway.

I have not the time on this occasion to more than mention the competition of pipe lines and power transmission. Railroad men know the extent to which that means of transportation is cutting their revenues. Obviously, constantly increasing competition, whether it be by highways, waterways, airways, pipe lines or power transmission wires, makes the problem of the railroads and the shippers more and more complicated.

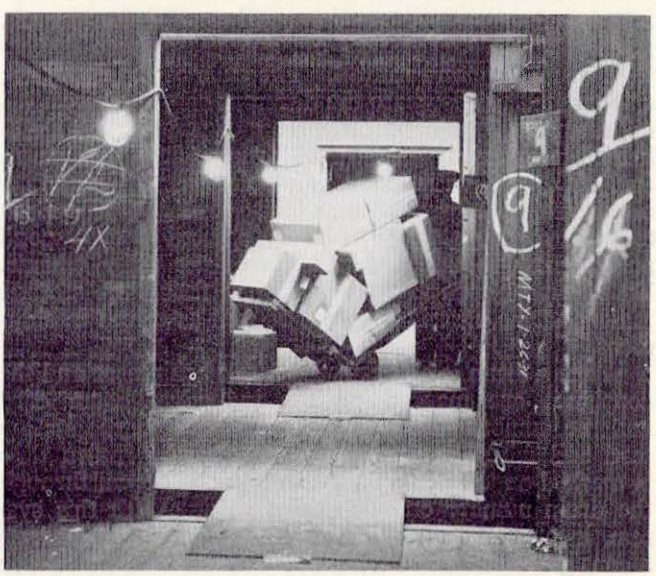
What are you going to do about it? The time has passed when there was a constant warfare between the railroads and the shippers. The railroads appreciate that it is only through the good will of their patrons that they can survive. On the other hand, the shippers have come to realize that notwithstanding the advent of the new and additional forms of transportation, the railroads are continuing and must continue to be their main reliance in moving the vast commerce of the country. They know that the production of commodities by our great industries would be useless unless transportation to move it were available. The same is true of raw materials and agricultural products. The shippers also know that the railroads are their best customers for the major portion of their output. Labor understands that the railroads afford the greatest opportunity for employment.

Therefore, all right minded citizens must realize the interdependence of the welfare of the railroads with their own prosperity and happiness. It is in the interest of all that the railroads should be treated fairly; that they should be adequately maintained; that their efficiency should be unimpaired either by the passage of too many laws and regulations or the nagging by shippers who sometimes are affected with myopic vision; that they should receive revenue sufficient not only to compensate them reasonably for the service performed but also to enable the hundreds of thousands of our citizens who hold their securities to receive a fair return upon their investments and that they should be able to continue to pay their employees living wages for their labor.

A Safety Lighting Cable for Freight Cars

A SAFETY lighting cable, which was originally developed for use in underground mining and construction work and which is known as Stringalite, has been adapted by the Sullivan Machinery Company, Chicago, its distributors, to the lighting of freight cars being loaded or unloaded at freight houses. This product was developed especially to provide the safety and utility of a permanent installation with the wiring simplicity of a temporary job.

The lighting system consists of a moulded rubber No.



The New Safety Lighting Cable in Use in Box Cars

10 two-conductor light cable with rubber covered porcelain lamp sockets vulcanized at the proper intervals. It is said that each part is thoroughly insulated against electrical leakage and is protected against moisture, corrosion and rough handling. Standard lamps are used and the cord may be hung on any projecting object such as a nail or bracket. It is said that sockets and connections are practically unbreakable.

Extensions can be made up for any given length and are provided with a two prong push connector which is plugged into the outlet beneath the edge of the freight-house platform. For four-car service the extension used is 50 or 75 ft. in length, with four lights placed at intervals of 12 to 14 ft., the last light being at the end of the cable.

In addition to service as outlined above, this lighting cable also has applications, either temporary or permanent, such as in railroad shops, on construction work and in tunnels.

N. & W. Yields Ideas in Stores Work

(Continued from page 168)

sive method of regulating the movement of oil barrels in a card system, which enables a store to determine instantly where each oil drum is located. A similar system has also been applied to handling shipping containers for bolts and rivets.

Two kinds of cards, each measuring 5 in. by 6 in., are used. There is a card for each drum, on which is recorded the date of each shipment, the consignee, the destination, and the date of return; also the number of the drum, the capacity, and the kind of oil carried. There is also a card for each consignee, which shows the numbers of the drums he receives during the life of the card.

The cards are fastened to panels on a revolving stand, each panel holding 82 cards on each side, with the individual drum record cards arranged in numerical order and the shipping-point record arranged in alphabetical order. White cards are alternated with pink cards in the rack to facilitate reading.

All oil drums are numbered and divided in groups for different oils; for example, drums from 1 to 100 are used exclusively for valve oil, drums from 101 to 500 for engine oil, those from 501 to 800 for car oil, from 801 to 900 for fuel oil, and those from 901 to 1,000 for flange and rail oil. The ends of the drum are also painted to designate the different oils. Thus, valve-oil drums are painted brown on each end, engine-oil barrels are painted blue, car-oil drums with green paint, fuel-oil drums with black paint, and flange- and rail-oil drums with gray paint. The valve and pipe lines to and from the storage tanks are painted to correspond and a chart in the oil-house shows the color scheme. These precautions avoid mistakes in filling the storage tanks and the barrels with oil, as well as errors in shipment.

When a drum is shipped, the date of shipment and the consignee are marked on the individual drum card and the number of the barrel is marked on the station card and when the barrel is returned the return date is marked on the drum card and a line is drawn through the drum number on the station card. With this system, it is possible to tell at a glance how many barrels a consignee has outstanding and to determine when each barrel was shipped and to whom it was shipped. It is also provided that drums shipped to smaller points from division storehouses should be transferred in groups so that the oil-house can tell readily by the number of the returned drum if it went to the wrong destination.

NORFOLK AND WESTERN RWY. CO.

IRON BARREL RECORD CARD

DELIVERIES				RETURNED	
DATE	FROM	TO	ADDRESS	DATE	
8-4 1927	Roanoke	S.K.	Lambets Point Va	10-3	27
10-10 "	"	Section - Pt 11	Glasgow Va	1-26	28
2-3 1928	"	" " 12	Scottsville Va	6-22	28
6-25 "	"	W.B. Hawkins	Yard Office Roke	7-15	28
7-18 "	"	R.E. Bailey	Balcony Va	4-23	29
4-29 1929	"	S.K.	East Radford Va	5-1	29
7-17 "	"	G.W. Dott	Huff Mill Roke	4-29	30
10-22 1930	"	Section Pt 13	Mountain Solum NC	12-6	30
12-10 "	"	S.K.	East Radford Va	2-19	31
3-4 1931	"	J.E. Bostian	Narrows Va		

DRUM No. 4423 CAPACITY 55 GAL. KIND OF OIL Gasoline

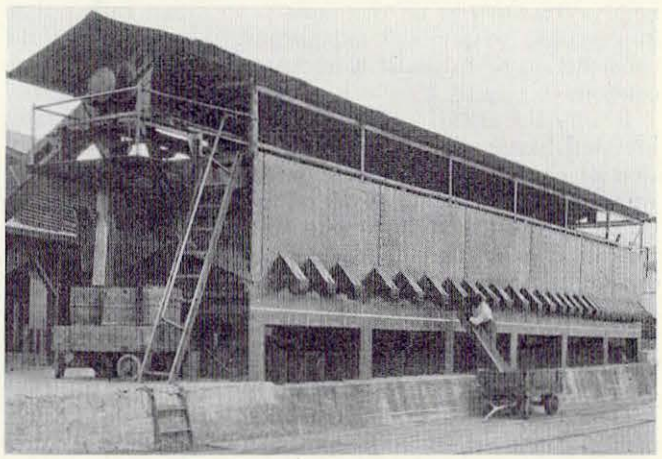
A Record is Kept of Each Oil Drum

It is possible also to tell readily by the number and color of empty drums if they were used for the wrong oil.

A similar record in the storehouse has eliminated difficulty previously experienced in getting shipping containers back to the general store promptly.

Handle Rivets Like Coal

A facility used by the Norfolk & Western for handling rivets is a departure from the conventional methods in use for such material. It consists of an elevated steel hopper containing 55 pockets for different sizes of rivets. The structure is 61 ft. long, 10 ft. wide and with pockets 5 ft. deep, and was built by fastening second-hand car plates to a frame of old



Rivet Storage at Roanoke, Va.

rails supported on a concrete foundation. As the rivets are made, they are elevated by a conveyor to the top of the bin and carried by a horizontal conveyor to the proper pocket, where they are stored. The description of the contents is stenciled on each pocket, and the rivets are removed by chutes, which are high enough on one side so that the material can be discharged directly into a car as well as dropped into containers for movement directly to the shop or for shipment by the stores to outside points, as required. This method of handling dispenses with cooperage and affords other advantages of bulk shipments.

I. C. C. Digs Deeper as Reciprocity Hearings Near Close

Compares coal prices—Influence of political interests noted—Asks for expenses of freight solicitors—Higher fuel prices for traffic shown

THE fact-finding investigation of the Interstate Commerce Commission into railway purchasing and traffic approached the end on July 23 when the hearings were adjourned at Cincinnati, Ohio, preparatory to the final hearing at Philadelphia, Pa., on July 29 and 30. The Cincinnati hearing was devoted to the Cleveland, Cincinnati, Chicago & St. Louis. In addition to the testimony reported in last week's issue of the *Railway Age,* the political influence brought to bear on the road's purchasing was a subject of inquiry at this hearing; also the traveling expense of freight solicitors, while the session was marked by testimony of H. A. Worcester, resident vice-president, that the road had paid commissions and higher prices for coal for traffic reasons. The commission's reciprocity record now contains more than 12,000 letters from railway files, not including elaborate statistical compilations of material prices, bids, contracts and traffic reports.

Big Four Policies

W. J. Hiner, purchasing agent of the Big Four, stated that sellers are almost continually raising the question of traffic in soliciting orders and, while no hard and fast rule is followed in recognizing their traffic in miscellaneous buying, the traffic value of firms has an important bearing on all large-scale purchasing. He stated that bidders are allowed to revise their quotations in competitive bidding, but that he personally did not disclose the low bid, although agreeing that bidders seem to have ways of securing such information. The delivered cost of material, he said, determines whether industries located on the road will be preferred to off-line firms.

Prior to the consolidation of the Big Four as an operating part of the New York Central in 1930, the road obtained its fuel requirements from 10 districts, four of which were located on foreign lines. The amount of coal secured from each district was governed by the delivered cost of the coal to the points of consumption and traffic, and the distribution of the orders was based on traffic. Except in the Indiana field during the strike of 1927, the practice was to fix the price in each district after considering quotations and negotiations with operators. The price paid for coal from the mines located on the road was set just below the delivered cost of foreign coal.

Most of the coal, Mr. Hiner said, is purchased directly from the mine operators. Prior to 1927, yearly contracts, stipulating a minimum and a maximum tonnage, were prevalent, except where coal was not purchased directly from operators, but the amount of contract coal was reduced to one-third of the requirements in 1929 and at present only the coal from operators south of the Ohio river is purchased under such contracts.

J. E. Anderson, traffic manager, explained that the recommendations of the traffic department covering coal purchases were based on the percentage which the amount of the commercial coal traffic which each shipper routed over the road during the previous year was of the total commercial coal traffic shipped over the road and that these shipments were adjusted in the case of off-line operators to show, so far as practical, only the commercial coal traffic which the shipper controlled. He stated that no definite minimum of commercial coal traffic was applied to determine who should and should not receive coal orders, except that in general the road favored limiting orders to concerns whose traffic would entitle them to a minimum of 15,000 tons of coal per year, which was the equivalent of a car per day.

Mr. Hiner stated the prices paid for coal in the last four or five years were sometimes higher than the prices paid for commercial coal. He was aware that prior to the consolidation, the Michigan Central and the New York Central had paid from 10 to 15 cents less for coal in the fields located on the Big Four and said that the road could probably have forced its prices lower, but defended its position with the statement that the road endeavored to pay a fair price to the operators on its lines. When asked if the Michigan Central and the New York Central were not paying a fair price at the time, he explained that the coal was competitive for those roads. Questioned regarding offers of operators on the Michigan Central to sell coal to the Michigan Central at lower prices, he stated that such offers would not be accepted when the road had contracts and that the policy was against taking the entire output of a mine to get a lower price. The road, he said, purchased but little spot coal.

The consolidation of the Michigan Central with the New York Central in 1930 and the elimination of the freight charges of coal mined on the New York Central resulted in readjustments in the Big Four's coal supply, he said. Since 1930, the coal purchased south of the Ohio river has been largely replaced by coal shipped from mines on the New York Central, but the coal used in Cincinnati and the immediate vicinity, aggregating about 200,000 tons a year, is still purchased south of the Ohio river because of the favorable cost and for traffic reasons.

The letters showed that the Amherst-Logan County Coal Corporation had a coal contract to supply coal from a mine on the Big Four, but closed the mine and requested orders from a mine on the E. I. & T. H. To do this, it was stated in the letters, would require the payment of freight by the Big Four to the E. I. & T. H. and also require an exception to the allotment rule of prorating coal on the basis of the tonnage produced by the mine supplying the coal, which was done. Mr.

Worcester stated that the payment of freight to the E. I. & T. H. was purely an accounting matter because the road was owned by the Big Four.

Switching Service

In a subsequent letter relating to efforts to get the Merchants' Heat & Light Co., a utility in Indianapolis, to influence coal traffic, on which the Big Four was being short-hauled by the Bledsoe Company, the general freight agent suggested slowing up the switching service when the business came from connections and received the reply that the plan had been considered but abandoned on the understanding that the power company would complain to the Public Service Commission.

The correspondence included a letter written in April, 1929, for the "private" information of the general freight agent that the Walter Bledsoe Company had been given credit for coal shipped by the Coal Bluff Mining Company. Mr. Anderson contended that the reason for this was not because the Coal Bluff Company was too small to secure orders direct under the allotment plan and stated that the word "private" in the correspondence did not mean that the information was to be kept secret. Further correspondence showed that the credit for coal shipped by the Bledsoe Company and another coal operator was subsequently placed with the United Collieries Company which had acquired contracts to secure coal for several utilities.

The letters also showed the Cabin Creek Consolidated Coal Company, failing to get fuel orders although shipping 100,000 tons of coal traffic over the Big Four, requested a list of the 15 firms on the Chesapeake & Ohio lines who shipped more coal over the Big Four, and that Mr. Anderson replied in part:

> "I am somewhat doubtful about the propriety of furnishing the information you request. However, attached is the list of shippers appearing in the order of the commercial shipments of coal by way of our line."

Mr. Anderson stated that this was an exceptional instance and that he saw no objection to it, adding that volume and movement of traffic was not disclosed.

Traffic Credits and Reserve Fuel Orders

The letters showed the Cabin Creek Company was later consolidated with the Truax-Traer Coal Company, which began soliciting fuel orders from the New York Central lines, with the announcement that "it is our intention to keep a careful account of all coal routed over the various lines with a view of receiving reciprocal company coal" and the further announcement that the financial interests behind the company controlled the Greyhound lines and the Universal Aircraft Corporation. Informed that the Big Four allotted its coal on the basis of the previous year's tonnage, the Traux-Traer Coal Company, the letters showed, stated that the Erie and the Nickel Plate were buying coal from them and that the Baltimore & Ohio had contracted for 60,000 tons of fuel in return for a promise of 175,000 tons of commercial traffic and informed the road that it would divert all possible traffic from the Big Four lines.

Subsequently, in building up its coal traffic, the letters showed that the Truax company claimed credit for routing certain coal purchased by the Solvay Company, although it was reported that the Solvay Company insisted on controlling the routing of the coal it purchased and was "using the coal tonnage as an argument for receiving a substantial part of the road's requirements for soda ash." Mr. Anderson stated that the road was opposed to giving two firms credit for the same tonnage but might give a firm credit for miscellaneous tonnage purchases.

Following a period of correspondence in which the Capitol Fuel Company solicited spot coal orders in return for coal traffic and eventually began routing against the road, J. E. Anderson, then general freight agent, pointed out to the traffic manager that the smaller companies could, in the aggregate, influence a very considerable volume of tonnage and recommended that reserve fuel tonnage be parcelled out in small lots. Mr. Anderson testified that this recommendation did not materialize and was not consistent with the Big Four policy.

Questioned about a letter in which a broker of coal from mines on the Norfolk & Western suggested combining its tonnage with the tonnage of some operator on the Louisville & Nashville or Chesapeake & Ohio who did not ship a sufficient tonnage to secure direct orders, Mr. Worcester stated that the Big Four had never adopted a policy of this kind.

It was brought out that the Crown Coal & Coke Co., after repeatedly soliciting fuel orders from the Big Four on the basis of coal shipments from the Norfolk & Western to the American Steel & Wire Co., the National Tube Company and similar concerns, at first failed to receive orders because of insufficient previous traffic, and threatened to divert 3,000 tons of coal per week which it claimed to control, subsequent to which letters showed that the president of the concern was the son of an officer of the American Steel & Wire Co., and spot orders for five or six cars of fuel coal per week were placed, with the result, as reported by the letters, that the traffic was turned back to the Big Four. The letter also showed that the coal dealer was subsequently awarded a larger coal contract by giving him credit for the coal supplied to the National Tube Company.

Mr. Anderson was referred to a letter written November 21, 1929, in which the general freight agent had recommended a reduction in the fuel orders for the credit of M. A. Hanna, and a corresponding increase in fuel orders for the Y. & O. Company, and a letter written three weeks later, referring to certain new coal business received from the Y. & O. people and stating that "it is a fact that our increased allotment of fuel coal has had effect toward holding this business to our line."

Mr. Anderson was asked if it was not a fact that the road never adhered to its policy of allocating orders on the previous year's traffic as long as there was a chance to get or hold traffic, but he maintained that such deviations were rare.

Storage Coal and Traffic

On February 13, 1929, the general manager of the Big Four wrote a letter to Mr. Worcester in which he said in part:

> We still have on hand 226,005 tons of coal ..... This coal has been down a good while, representing an expenditure of $740,000 and the accumulated interest amounts to about $170,000 now. Don't you think it would be wise to pick this coal up and use it and stop the accumulation of this interest which will make the price per ton of the coal very high?

Mr. Worcester stated that the coal was stored in anticipation of the strike of 1927 and stated that it had not been picked up before because of vigorous protests from operators. Some of the coal has been on the ground five or six years and has not yet been picked up, he said, and that it was subject to depreciation.

Mr. Worcester was questioned regarding the disclosures of over a hundred letters dealing with the road's experiences and relations with the Enos Coal Company, from which the road ultimately contracted to buy off-line coal at a fixed ratio to commercial traffic.

Among the letters was a report to G. H. Ingalls, vice-president of the New York Central lines, dated December 7, 1929, in which Mr. Worcester said in part:

The Big Four has literally made Enos. He has paid off all the bonds on his property, is now paying dividends and is one of the few mines in the country that is doing this. He is not poverty stricken, but he is always asking for something. We have given him a very liberal contract, but there is hardly two weeks of the year past that he isn't asking us to buy extra fuel. He makes it a practice to keep several hundred cars of coarse fuel on his tracks which he could dispose of if he would reduce the price, but he will not sell it and keeps pestering us to buy it from him at contract price, in addition to his regular contract fuel.

No-Bill Coal

In another letter received by Mr. Worcester March 16, 1929, the general manager said:

I think we will have to shut down on Enos' no-bills. This morning, while reporting only 76, which is 100 per cent, he actually has 450 on hand. I am exceedingly worried as to what will happen if McGarry (A. R. A. Car Service Division) found this out. McGarry, as you know, has been handling a series of meetings about the no-bill situation in Indiana and Illinois, and these meetings have been very acrimonious and spirited. We, together with the Pennsylvania and four other roads, have stuck out for 100 per cent, while the Illinois Central and two or three other roads have agreed to go to 200 per cent.

Mr. Worcester stated that this coal was held on mine tracks in a yard of the railroad three or four miles from the mine track and recalled an instance where the road had bought coal at higher prices than Enos had paid for it because it had been in cars for more than six months and was deteriorating the cars. He said it was a common practice to hold no-bill coal in these yards but claimed that the Big Four had adhered more closely to the A. R. A. rules than other roads.

Coal Prices

He was also questioned about a letter in which the purchasing agent, discussing the road's difficulty with the Enos Company, on April 23, 1929, said in part:

I cannot get away from the thought that just as long as we pay so much more for railroad fuel than they can get for commercial coal just that long Mr. Enos will bend all his efforts to try to sell us coal.

Another letter written on April 26, 1927, showed that Mr. Hiner awarded orders to a mine on the Big Four to supply fuel coal to the Big Four at $2.25 a ton and to the New York Central at $1.90 a ton, while subsequent correspondence showed that an operator on the Big Four had sold coal to the St. Louis-San Frisco at $1.75 a ton and had offered to supply coal to the Indiana Harbor Belt and the Chicago Junction at $1.75 a ton, but protested the action of the Big Four and the New York Central, taken at the instance of W. C. Bower, vice-president of the New York Central lines, to reduce the price they paid for fuel coal from $2.15 to $2.05 a ton.

Mr. Worcester stated that it was the general practice to pay more for the fuel from mines on its lines than the mines secured for commercial coal, and that he had favored continuing the $2.15 price to hold certain traffic, adding that commercial fuel, being highly competitive, did not pay its own way, and further explaining that the other lines of the New York Central were compelled to pay freight on coal foreign to their lines.

In a letter dated June 11, 1926, Mr. Worcester, writing to G. H. Ingalls, vice-president of the New York Central about Norfolk & Western coal, said in part:

If we were to follow the policy of buying our coal at the cheapest price we could find, we unquestionably could get a somewhat cheaper price from our L. & N. and C. & O. friends, as I happen to know that the L. & N. buys its coal at a price somewhat less than the price we name.

I don't doubt it would follow if we bought cheaper coal from the N. & W. than we did from the L. & N. that it would hurt us far more than we are now being hurt.

Questioned about this letter by Examiner Rogers, Mr. Worcester stated that it was true that the Big Four paid the higher prices for coal for traffic reasons.

Coal Commissions and Optional Coal

Mr. Worcester was also questioned at length about the relationship of the road with the Pickands Mather Company and the United Collieries Company. Over a period of several years, the letters showed Pickands Mather, shippers of lake coal, had expressed dissatisfaction with fuel orders obtained from the Big Four and the letters showed that subsequently contracts were placed with Pickands Mather to be filled by the United Collieries Company from several operators on the L. & N. The letters also showed that in return for getting this order, the United Collieries would give the Big Four the benefit of routing on coal they purchased in the Chesapeake & Ohio field. Mr. Worcester was first asked about a letter indicating that certain of the fuel orders were filled from mines in Kentucky instead of from mines on the Louisville & Nashville and he explained that Pickands Mather were asked to ship from the Louisville & Nashville mines, but were not obligated to do so, and he stated that they were permitted to buy the coal at any price they could get it for. Asked why he did not buy direct from the operator, he then explained that the road had placed the fuel orders through the Pickands Mather Company for traffic reasons and had been permitted to do so by an agreement on the part of certain operators to allow the Pickands Mather Company credit for the coal they shipped in previous years. It was understood from the testimony that the price paid Pickands Mather was $1.75 per ton, while the price paid for coal purchased direct from the operators was $1.65 per ton.

Mr. Worcester was then asked to explain the proposal made with the United Collieries after the United Collieries had severed its connection with the Pickands Mather Company, and he explained that the Big Four was to place a fuel order of 200,000 tons of coal to be purchased from operators on the E. I. & T. H. by the United Collieries Company at a price allowing the United Collieries Company the commission of 10 cents a ton, or a total commission of $20,000, in return for which the United Collieries Company would buy 400,000 tons of commercial coal from the same operators. Mr. Worcester was asked by Examiner Rogers if he favored paying $10,000 more for coal in return for $50,000 of traffic, and replied in the affirmative, and, after repeated questioning, agreed that these commissions were in the nature of premiums to get traffic.

The letters showed that following correspondence between the New York Central lines about traffic diversions by the Peabody Coal Company, this company was awarded a confidential contract for fuel for the Indiana Harbor Belt, following which it was reported in the letters that the embargo had been lifted against the New York Central lines during the period. The letters showed that Samuel Insull became chairman and Samuel Insull, Jr., became vice-president of the Peabody Coal Company and that the traffic which had influenced the Big Four in awarding the fuel contract was coal for Insull utilities. Subsequent to this contract, Mr. Anderson received a letter on April 19, 1929, in which the former traffic manager said in part:

For your information, arrangements have been made whereby all system lines will take their full allotment of fuel tonnage during the months of May, June, July and possibly August, from the Harrisburg field in two-inch lump, and as a result the Insull interests will place with the Peabody Coal

Company an order for 240,000 tons of fuel coal to be shipped to the State Line Generating Company, shipments beginning about May 6 and continuing until the end of the week commencing September 16.

Mr. Worcester stated that the Big Four had been taking mine run coal from that field and that the two-inch lump would cost more and agreed that the change was made to accommodate the Insull interests, but stated that it was a common practice to allow operators to ship sized coal when it would facilitate their commercial sales activities.

Mr. Anderson was questioned at length about correspondence showing that the road had secured the coal shipping records from other roads. One of these letters, received September 10, 1929, stated in part:

Mr. Ousey is making the trip through the L. & N. coal fields this week. I received word from him today that the agent at Neon, Ky., refused to permit him to look over the billing.

This was brought about by assistant master of trains becoming informed of the last visit of Mr. Ousey.

This was followed by letters expressing the hope that the agent could secure information on the Cumberland Valley division of the Louisville & Nashville and subsequent letters stating that another agent had seen the records of the C. & O. on fuel coal shipments to other roads. Mr. Anderson stated that the letters were written without his personal knowledge.

Mr. Anderson was questioned about these letters and another letter written in 1927 showing that the O'Gara Coal Company had obtained "complete" information regarding the shipments from various mines on the Big Four and that in 1929, in reply to a question by Examiner Rogers, he stated that he had not inquired as to the legality of the practice, but agreed that the practice was one of divulging information about a shipper's traffic. He disclaimed knowing how the agents got the information and was finally asked to furnish the commission with a statement of expenses allowed traffic solicitors for entertainment.

Politics and Purchases

The officers of the Big Four were also questioned about several letters in the correspondence showing that political influence had been brought to bear on the road in directing its purchases. On May 12, 1930, W. J. Hiner, purchasing agent of the Big Four, received a letter written on State House stationery from F. D. Sampson, governor of Kentucky, reading in part:

Judge R. B. Roberts, of the Felix Coal Company, Letcher County, has bid to furnish your railroad company coal, and I understand his price is good.

Judge Roberts would greatly appreciate an order for two cars per day, if no more, and I believe you would be pleased with the service his company would render. I hope you can give him a contract.

In another letter, written on U. S. Senate stationery, Senator J. M. Robison also wrote to Mr. Hiner, stating in part:

Circuit Judge R. B. Roberts and others of Hazard, Ky., owners and operators of the Felix Coal Company on Rock House Creek in Letcher County, Ky., advise me that they have submitted a proposition to furnish coal to your railroads. Any consideration given them will be greatly and personally appreciated by me.

Other letters reported that United States Senator Watson and Ex-Governor Goodrich of Indiana were interested in the outcome of negotiations with the Enos Coal Company. Reference was also made in the letters to the importance of taking into consideration the Mellon interests in negotiating fuel contracts with the Koppers Coal Company.

In another letter written on July 20, 1929, concerning cement purchases, the traffic department was informed that Traffic Manager Edrington of the Southwestern Portland Cement Company was "the speaker for the House and is going to use drastic measures to force Mr. Hiner to come to him. . . . We, of course, must be careful."

In another letter, the influence behind the Fleming Coal Company, Chicago, was reported in part:

Further investigation indicates that Mr. Fleming, the president, is a lawyer and was formerly connected with Maclay Hoyne, who was formerly the States Attorney. Therefore, of course, he is a politician and Mr. Barrett, connected with these people, is a son of Mr. Barrett who is at the head of the Board of Reviews tax department at Chicago.

This concern is capitalized for $100,000 and we have heard in a roundabout way that Maurice Rosenwald, Julius Rosenwald and Mr. Hertz are interested financially. The Rosenwalds, as you know, are the Sears Roebuck people, and Mr. Hertz is the president of the Yellow Taxi Cab Co., Chicago, and the Yellow Cab Manufacturing Company, Chicago.

My informant also told me Mr. O'Hara of Swift & Co. was interested in this proposition, and he stated very plainly that Mr. O'Hara's interest was personal. Of course, I have my own views about this.

Penna. Testimony in Reciprocity Hearings

The Interstate Commerce Commission hearings on the relationship between railroad purchases and traffic solicitation were continued in Philadelphia, Pa., on July 29 and 30, testimony being taken from officers of the Reading and the Pennsylvania. Director Bartel of the Commission's Bureau of Service presided, with Examiner List as the commission attorney. All of July 29 was devoted to witnesses from the Pennsylvania, those from the Reading being heard on the second day.

The first witness called was C. D. Young, vice-president and purchasing agent of the Pennsylvania, who was interrogated at length by Examiner List. Mr. Young explained that it is the company's practice to acquaint itself with sources of supply and the quality of materials it proposes to purchase; only after it is satisfied in this respect do traffic considerations enter in. He explained that the secretary of the company supplies a list of firms which come under the provisions of the Clayton Act requiring competitive bidding; if any of these firms are in any way involved, the purchasing department acts only as directed by the legal department. Asked if he saw any objection to purchasing all classes of material in this manner, he answered that for many supplies—coal, for instance—such methods would not be satisfactory.

The company, he continued, tries to purchase as many of its supplies as possible—quality and price considerations being equal—from industries on its own line, acting on the theory that of every dollar it thus spends a portion comes back to it in freight revenues. Coal prices, he said, after careful consideration, were fixed at what was considered to be a fair price to both the producer and the railroad—a price which would average out at about the same as that paid by commercial users. Some coal is contracted for under cancellable contracts and some is purchased at spot prices as needed. The prices of the latter since 1927 have been generally lower than contract prices. The Pennsylvania purchases some off-line coal, principally from mines on the Norfolk & Western, the Louisville & Nashville and the Baltimore & Ohio. Most of this coal is delivered to the Pennsylvania at Louisville and Cincinnati and was chosen because of the desire of communities interested in reducing smoke by the use of low-volatile coal. Off-line coal is secured at a price f.o.b mine which will average about 25 or 30 cents less a ton than the price paid to on-line mines. Paying a slightly higher price to on-line mines, the witness said, is justified by the fact that to pay less would weaken the industry to the point where many

mines might have to close down. This would divert consumers to other sources of supply and the railroad would lose its commercial coal tonnage—a most important source of revenue. Furthermore, on-line operators, regularly patronized year in and year out, in times of stress would protect their steady patrons both as to price and deliveries. Off-line prices were lower than on-line contract coal at present but in periods of coal shortage, off-line prices were much higher.

Mr. Young explained the method of assignment of tonnage to the various on-line mines—usually on a basis of the same proportion of railroad coal as the particular operation supplies of the total commercial coal in the district. He said that the purchasing department cooperated closely with the traffic department in maintaining an equitable balance. He was asked whether he favored spreading purchases around among a number of firms or concentrating upon a few and indicated his preference for the former method. He added, however, that his company would not contract for coal which would cause the opening of a new mine. Very low prices, he said, were generally obtained for relatively small quantities of coal, but if such prices developed further an effort was generally made to adjust the contract coal downward toward these prices. In answer to questions, the witness explained that the Pennsylvania stores coal only when strikes threaten. Coal properly stored deteriorates only slightly.

The company buys cement from a number of firms—two-thirds of it being off-line and the traffic department is consulted to secure an equitable distribution of the business among the road's patrons—the latter consideration, however, not being allowed to predominate over price and quality considerations. Cement prices were about the same with all manufacturers until the beginning of the current year, since when foreign competition has forced prices smartly downward. All lumber is purchased by competitive bidding, a growing proportion (about 80 per cent) directly from the mills. Steel rails are purchased by competitive bidding but all bidders name the same price. Hence the orders are allocated according to a definite percentage among three producers, the orders being placed with mills nearest the points where the rails are needed. The company does not buy compounded lubricants but instead purchases the various ingredients by competitive bidding on a price basis and mixes them itself. The witness said that the traffic department had endeavored to interest his department in prepared lubricants but that it had not succeeded in doing so.

He stated that the mechanical department had supplied the purchasing department with a list of draft gears approved after thorough test and that his department met requirements by consulting this list. Purchase of the Waugh-Gould gear began only when it was approved and after it was quoted at a satisfactory price. He had no conference with any representatives of Armour and Co., and had no recollection of ever discussing the Mechanical Manufacturing Company with R. O'Hara. He had but slight knowledge of individuals who had secured the privilege of routing traffic for firms. The railroad had purchased large quantities of paint from the Charles R. Long Paint Company, but only under competitive bidding.

In purchasing cars and locomotives the company draws its own designs and invites manufacturers to inspect them. Sealed bids are then asked for. Usually the lowest bidder, if the lowest bid is satisfactory, will be favored in placing the order, but others also will get a share of the business if they meet the price. The company's own shops also build some equipment. Their prices are, he said, no profit considered, usually somewhat lower than those from outside manufacturers. Certain manufacturers, he said, have protested at the company's building some of its own equipment, but it has nevertheless continued to do so.

The second witness was J. L. Eysmans, vice-president in charge of traffic. He described briefly the organization of his department. In soliciting traffic on a basis of railroad purchases, he said, his department would calculate the proportion of traffic to which it felt it was entitled and would use this in talking with prospective patrons—but it would not use its purchasing policy to threaten anyone. The department has a list of principal patrons and their total traffic offered the railroad, either in tons, carloads or in revenue. The department is informed regarding the proportion it secures of the traffic of firms who also patronize competing railroads. The Pennsylvania's ownership of New York, New Haven & Hartford stock was given at approximately 15 per cent of the total. The Pennsylvania officers, however, he said do not use this relationship in any way to influence New Haven shipments via the Pennsylvania. They seek traffic, but approach the New Haven in the same manner as they do any other connecting line with which traffic is interchanged. Solicitors are not instructed to attempt to secure routing via the New Haven, although solicitors of the two roads might exchange friendly "tips" with each other on prospective traffic. He had consulted with New Haven officers often, but never in the presence of General Atterbury. He had consulted with F. Taplin of the North American Coal Company in the presence of General Atterbury, but the major subject was railroad consolidation. He did not remember, he said, that Mr. Taplin had threatened to divert traffic unless given orders for more coal but, if so, he did not take such threats seriously. [It was later testified by Mr. Young that Mr. Taplin had sought to sell coal to the road at a price higher than it wished to pay and that the road refused; notwithstanding which the Pennsylvania now handles more traffic from that company than it did prior to the discussion.]

Mr. Eysmans said he knew of traffic managers who served several small companies, some of whom had approached him on the subject of purchases in the same manner as other shippers had done. He did not know of traffic "brokers" or those who paid firms for the privilege of routing their freight or who sought premiums from the railroads for traffic given them. No representatives of packing concerns had ever urged draft gear purchases in return for traffic. Fred Ellis of Armour and Co. had told him that President White of that company was interested in the Waugh-Gould gear and he [the witness] asked the purchasing department to consider it. That department, however, had not purchased this gear until more than a year later and then only after it was satisfied with the gear both as to quality and price. Mr. O'Hara, he said, had never asked him to recommend the purchase of draft gear.

The Pennsylvania also put in testimony regarding reasons for the varying prices of coal in the same locality—varying quality, varying length of haul, etc. In closing, H. W. Bikle, vice-president (law) of the road, asked if the commission were through with his company in this inquiry. Upon being informed that it was, unless it was decided to include the matter of the taxicab concession at Pennsylvania Station, New York, in the investigation, he entered formal protest against including that matter in the present proceeding. He suggested that a field investigation be made and, if sufficient grounds for formal inquiry were found, which he doubted, that such inquiry be made a separate proceeding.

Odds and Ends . . .

Still Another Guilty Conscience

There seems to be no end of troublesome consciences. The treasurer of the Erie, J. G. Walsh, reports the latest conscience stricken person who sent a money order for 75 cents from Silverton, Ore., as restitution for a stolen ride from Elmira, N. Y., to Corning.

Bees

Bees, swarming by the thousands, recently descended on a freight yard at Hoquiam, Wash., routed a section gang and switching crews, and took full and undisputed possession. Work was at a complete standstill until the switching crews made a counter attack with jets of live steam from a locomotive. The bees retreated after about 30 minutes.

The First White Child in Oklahoma Territory

Quite appropriately E. D. Jones, traveling freight and passenger agent for the Missouri-Kansas-Texas, took part in the historical celebration incident to the recent opening of the union passenger station at Tulsa, Okla., for he was the first white child born in original Oklahoma Territory, before Indian Territory was incorporated with it to form the state.

A New Narrow Gage Line

A Detroit (Mich.) newspaper has presented the Detroit Zoological Park Commission with a miniature railroad which operates on a two and one-half mile track around the city's zoo. The present equipment consists of two locomotives and 14 coaches which have a passenger capacity of 298. The only condition attached to the gift was that a 5-cent fare be charged.

Pullman Hammocks

George E. Lawton, a former Western Union telegrapher, spinner of railroad yarns, and possessed of an appellation—"Old Farmer"—bestowed by Eugene Field, died recently. Lawton was responsible for the story of George M. Pullman's visit to Colorado and New Mexico, when the casing of a papoose was alleged to have been the inspiration for the small clothes hammocks used in sleeping cars.

Mice Raid Australian Railway Station

Coming apparently "out of the sky," a plague of mice, numbering millions, has invaded the Nullabor plains, along the trans-Australian Railway. The station-master of Loongana says that miles of the country are infested with this latest pest. While he was attending to the passengers of a train, thousands of mice entered his office, and began to devour a roll of 100-pound notes.—Railway Gazette.

Red Ant Flags Train

Train No. 41 on the Knoxville division of the Southern was recently stopped by a red signal near Bearden, Tenn. The signal maintainer, upon investigating, found that the relay contacts were being held off the clear position by some object between the contact points. This object proved to be a large red ant. The ant had evidently crawled on top of the contact point when the relay was in the neutral position and when the relay picked up, his body was caught between the contacts.

Short For Rail Motor Car

No sooner had we recovered from the shock of learning that "siderodromophilie" meant nothing worse in French than an excessive love of railroad riding, than we discovered that the French have coined a new railway word. The French roads have dubbed a rail motor car, several of which have recently been placed in branch line service in that country, an "automotrice." Possibly the word had its derivation when an old French rail, intolerant toward anything except locomotives and cars, remarked, "None of those automotricks for me!"

Secretary of the Interior

It isn't often that we find a federal cabinet officer and surgeon in one and the same person and it is even rarer that a patient has the privilege of being operated on by a cabinet officer. Yet that is what happened to Victor De Merschman, president and general manager of the Rio Grande Motorway, Inc., motor transport subsidiary of the Denver & Rio Grande Western. De Merschman was stricken with acute appendicitis while escorting Dr. Ray Lyman Wilbur, secretary of the interior, through Mesa Verde National park in Colorado, on the occasion of the secretary's recent trip through the West. At the park hospital Dr. Wilbur decided an immediate operation was necessary, and assisted by another doctor he performed it.

300 Miles For Three Minutes' Fishing at 3 A.M.

Three Pennsylvania employees, Augie Whiteman, yardmaster at Detroit, and E. R. Kincaid and Max Dietrich, conductors, recently traveled 300 miles to Beulah, Mich., to participate in three minutes of smelt fishing. Each year in Michigan smelt spawn in the small rivers that feed from Crystal lake. Game laws allow only three minutes of fishing for smelt, which are caught by the hundreds of thousands in that time. At 3 o'clock on the morning of the appointed day, lights are turned on by the state game wardens, and left burning for only three minutes, after which all fishing ceases. The smelt are caught by wading in the stream, scooping them up with sacks. During the mad scramble Whiteman received a ducking and Dietrich sustained two blackened eyes.

Spanish Railroad Service

Rail-highway co-ordination appears to have been practiced in Spain for some time. W. H. Chisholm, European traffic manager for the Illinois Central, in a recent issue of the Illinois Central Magazine, describes a Spanish co-ordinated service in which donkeys, not trucks, constitute the highway vehicles. The village of Alcala de Guadeira, a suburb of Seville, provides practically the entire bread supply for that city. Twenty-five bakers make the bread with modern baking machinery. Each day the bakers load their donkeys with panniers filled with bread, the donkeys are driven to the railroad station, loaded on special cars and shipped by rail the 10 miles to Seville. In Seville the donkeys are unloaded from the cars and each, with a driver, starts out on a regular delivery route.

A Railway at Any Cost

"It takes a lot of philosophy to be a railroad man," said Carl R. Gray, president of the Union Pacific in a recent banquet address. "We had a funny experience one time in Oregon. There was a community up there in the hills that wanted a railway, and our railroad was the only one that could reach them. This meant a very expensive line—a very heavy grade line—which would be expensive to operate. We told them that they couldn't stand the rates that we would have to charge if we built that line. They said, 'We don't care what rate you charge, we will just underwrite any basis that you say you ought to have.' So we fell for that, and we built that line. There was a great celebration when the first train went up, and six months afterwards we were summoned to appear in this community for a hearing before the Public Service Commission on these rates. The hall in which we met the Public Service Commission was the hall in which the celebration had been held. The festooning of the celebration was still on the wall. Right over the commission as they sat to hear this case were the words 'Welcome Union Pacific.'"

NEWS

Missouri Pacific Begins Five-Day Week on August 1

Wage adjustments affecting officers and clerical forces of the Missouri Pacific will be made effective August 1 when employees will work and receive pay for five days a week instead of five and one-half, as at present. Officers and unorganized workers will continue to work 5½ days and will receive weekly reductions equal to one day's pay. The adjustment does not apply to employees in train service.

This development follows the action taken by the Brotherhood of Railroad Trainmen at its convention at Houston on June 4, when a resolution was passed asking employed members of the brotherhood to limit their working hours in an effort to provide jobs for idle members. The resolution favored a 26-day month for men in yard service, while men in road freight service are to limit themselves to 3,500 miles a month. Passenger men must not make a monthly mileage exceeding 5,500.

On June 25, the convention of the Brotherhood of Locomotive Firemen and Enginemen recommended the substitution of the six-hr. day for the present eight-hr. day, without reduction in pay. Steps toward unemployment relief and stabilization of jobs were adopted in the same measure, with establishment of a minimum force of employees recommended as part of the stabilization plan.

The action taken by the convention is in line with the movement for a shorter work day, unemployment relief and stabilization of employment instituted by the protective committees of the standard railroad labor organizations and later molded into a uniform program by the Railway Labor Executives Association.

Chicago Ordered to Share Cost of Subway

For the first time in the history of Chicago, that city has been ordered by the Illinois Commerce Commission to bear part of the cost of grade separation. By reason of a contract ordinance passed by the City Council on April 5, 1911, and amended on July 15, 1924, and accepted by the railroads, the railroads operating in Chicago are required to elevate their tracks and bear the cost. On April 16, 1930, the city petitioned the Illinois Commerce Commission to force the New York, Chicago & St. Louis and the Chicago & Western Indiana to construct a subway at Ninety-fifth street near Stony Island avenue, but the commission ruled that it had no jurisdiction since the case involved a contract. The city later amended its petition and after conferences with the railroads and the commission, certain agreements were made. During the hearings which followed, it was suggested that the city and the railroads share the cost and in anticipation of this arrangement, and in consideration of the substitution of a viaduct for a subway at 103rd street and the tracks of these railroads, the Nickel Plate agreed to bear the city's portion of the cost of the Ninety-fifth street project.

On July 16, 1931, the Illinois Commerce Commission ordered that the total expense involved at Ninety-fifth street, including the installation of the bridge structure, excavation, drainage, pavement, sidewalks and curbs throughout the subway and its approaches, changes of sewer, water and other municipally owned lines and right of way costs and adjacent property damage, be divided between the railroads and the city as follows: The railroads shall determine the relative proportion which they should bear if they should assume all of the expense. The proportion so determined for the New York, Chicago & St. Louis shall be its share but the city must assume the expenses arising out of right of way costs or property damage. The proportion determined upon for the Chicago & Western Indiana shall be divided equally between the latter company and the city. The city shall also bear that portion of expense for right of way or adjacent property damage which would otherwise accrue to the proportion of expense to be borne by the Chicago & Western Indiana.

Motor Coaches to Use C. & N. W. Chicago Terminal

The Chicago & North Western passenger station at Chicago is now a bus terminal as well as a railway station. Motor coaches to Omaha, Neb., and the Twin Cities, operated by Chicago & North Western Stages, bus operating subsidiary of the railway, are making the railway terminal their central point of interchange. According to G. W. Hand, assistant to the president of the North Western, this is the first instance of motor buses using a railroad terminal in a major midwestern city as the principal point for loading and discharging passengers. The space between the first-floor ticket office of the passenger terminal and the taxi-cab concourse, where the coaches will load and discharge passengers, will be equipped with ticket counters and baggage-handling facilities.

Reading Inaugurates Electric Suburban Service

Electrification of the Philadelphia, Pa., suburban lines of the Reading, involving an expenditure of $21,500,000, went into effect Sunday, July 26, at 3:01 a.m., with 140 electric trains and 32 electric crews operating daily. The new schedule increases the frequency of service from 31 to 73 per cent and train speed from 15 to 25 per cent.

Lines electrified include those from Reading Terminal, Philadelphia, via Jenkintown, Pa., to West Trenton, N. J., on the New York branch; Jenkintown to Lansdale, Pa., and Doylestown on the Bethlehem and Doylestown branches, and Glenside to Hatboro on the New Hope branch, affecting 144 stations and towns. The route from Wayne Junction to Chestnut Hill, Pa., the terminus of the Chestnut Hill branch, will be electrified as soon as the grade crossings on that branch have been eliminated. As reported in the *Railway Age* of July 11, work on these elimination projects is now under way.

New timetables have been issued and important changes made on the electrified branches. On the Lansdale branch, trains leave Reading Terminal generally 25 and 50 min. after each hour, while trains for points on the Doylestown branch leave the Terminal generally 50 min. after the hour. On the New York branch trains to West Trenton leave Philadelphia generally on the hour and 40 min. after the hour, and on the Hatboro branch, trains leave Philadelphia generally 15 min. after each hour.

More than 13,000 persons took the preinaugural inspection trips operated from all points throughout the electrified territory prior to the opening of the new electric service. The trains were open to the public, and tickets were sold at Reading stations, banks and business houses in the localities served, at the nominal charge of 10 cents for the round trip.

Seventy new multiple unit cars have been received and undergone rigid test runs, while instructors have finished teaching enginemen and train crews the new technique of handling the electrically propelled equipment.

The new electric cars, which cost $52,500 each, are 73 ft. long, seat 86 passengers, weight 126,500 lb. without passengers, and operate on an 11,000-volt single phase, 25-cycle overhead catenary system. A number of new developments designed by the Reading are incorporated in the cars, including a power bus line connector to save pantograph and trolley wear, a new design of ventilating system for the electric equipment, a spring motor-

nose suspension to facilitate changing of motors, a magnetic door latch and thermostat control, and a flexible air connection to the motors which is self-aligning and self-connecting. Each car is a complete unit, having its own battery and air compressor, with a control cab at each end. Electric-pneumatic brakes are used, and all cars are equipped with cab signals.

The seating arrangement consists of 37 crosswise seats and three longitudinal seats, each seating four persons. Grab handles are provided on the corners of the seat backs next to the aisle so as to give passengers a means of support. The seats are of the plush covered reversible type, with arm-rests and fixed footrests. Baggage racks are provided and each car has one toilet. There are no signal or emergency cords passing through the car, the signals being electrically operated by push buttons. A warning signal, consisting of a double-pneuphonic horn, is located on the vestibule hood at each end of the car.

Passenger Officers to Meet in Chicago

The American Association of Passenger Traffic Officers will hold its annual convention at the Edgewater Beach Hotel, Chicago, on October 20-21. The meeting will be devoted entirely to business discussion. A docket of subjects for consideration is now in preparation and members who wish to have subjects included are asked to send them to the secretary not later than September 10, for presentation to the docket committee.

Burlington Express Terminal Opened

The Chicago, Burlington & Quincy formally opened its $650,000 express terminal, at Roosevelt road and Canal street, Chicago, on July 24. The new terminal supplants a smaller one at Thirteenth and Canal streets, and is being used by the Railway Express Agency. It includes a two-story structure 310 ft. in length and a one-story portion 625 ft. long. The facilities provide for the loading of 25 express cars at one time, while 25,000 shipments can be dispatched daily.

Protest Closing of C. N. R. Stations

As is often the case, when services are curtailed by railways, there is a popular clamor against such a move for economy. For some time past the Canadian railways have been effecting economies in this and other ways, and the Canadian National, being a publicly-owned road, bears the brunt of the objection. Last week in the House at Ottawa there were protests from Quebec members against closing of stations, and the Minister of Railways, Hon. Robert Manion, had this to say in reply:

"The Canadian National will save a certain amount of revenue by closing stations throughout the country and protests have been received, but it is taking this action only where it means an actual gain in money and sometimes a large gain, As a matter of fact, if the people would continue to utilize the railways, the services would not be cut off. I shall, however, be glad to pass my hon. friend's representations on to the railway. The matter is in their hands, not in those of the government."

Officers Salaries Reduced

The Delaware & Hudson has made a reduction of 10 per cent, to take effect August 1, in the salaries of officers, so far as approved by the president, in all positions where the salaries are equal to or greater than those paid to division superintendents or officers of corresponding rank.

A report of reduction in salaries of officers by the Southern Railway has been published in Washington, D. C., but the only statement authorized by the road is that there has been a voluntary reduction of salaries by officers which was not intended to be made public.

Protest Government Competition With Warehouses

Warehousemen in Philadelphia are protesting against the alleged free storage of imported commodities said to be offered by the Inland Waterways Corporation, which operates the government-owned barge line. Officers of the Port of Philadelphia have carried their complaint to the Secretary of War asking him to take steps to stop the practice. It is stated that the government corporation secured an appropriation from Congress for the purchase of additional barges which it is now using as storage warehouses in competition with private enterprise.

Nebraska Tax Appeal Denied to C. & N. W.

The Supreme Court of Nebraska, at Lincoln, on July 21, denied an appeal of the Chicago & North Western from a valuation of $28,410,000 on the railroad property within the state for taxation purposes, which valuation was fixed last January by the state board of equalization. The railroad contended that it was assessed on a higher percentage of value than is used generally on property within the state, and that the total should be reduced to $22,000,000. The court said that unless the railroad has shown that the board omitted vital facts, or that fraud or apparent misjudgment was shown, it would not interfere.

Signaling Principles and Practices

R. H. C. Balliet, secretary of the Signal Section, American Railway Association, 30 Vesey street, New York City, has issued the thirteenth pamphlet in the series entitled "American Railway Signaling Principles and Practices"; a pamphlet of 82 pages, including 17 pages of questions to test the student's knowledge.

This is Chapter XVI, Interlocking. It describes the Saxby & Farmer machine; Saxby & Farmer English style; Style A machine (vertical locking bed); the electro-pneumatic, the all-electric, and the electro-mechanical. Drawbridge apparatus is fully described.

For some of the details the reader has to turn to other chapters; for example, Chapter 6, direct current relays, and Chapter 5, batteries; also, for details of power machines, Chapter 18 recently issued, and Chapter 19 yet to appear.

The chapter now issued costs 35 cents a copy or, to railroad employees, 25 cents.

Public Service Commission Enjoined in N. O. & N. E. Case

The Louisiana Public Service Commission was enjoined, on July 20, from interfering with plans of the New Orleans & Northeastern to abandon its passenger trains numbers 5 and 8, operating between Pearl River, La., and New Orleans, when United States Judge Wayne G. Borah signed the temporary restraining order and set July 30 as the date for hearing the matter before a special federal court of three judges. Several other railroads operating in the state have secured restraining orders against similar interference on the part of the Public Service Commission.

In all instances the petitioners have asserted that they will continue to give adequate service after discontinuing certain of their trains. Expenses of operation are in excess of revenues received from the trains in question, the petitions set forth.

Equipment Installed

Class I railroads, in the first six months of 1931, placed 6,951 new freight cars in service, the Car Service Division of the American Railway Association has announced. In the same period last year, 49,208 new freight cars were placed in service and two years ago there were 32,794. Of the new cars, 2,934 were box cars, while there were 2,957 new coal cars, 382 flat cars, 670 refrigerator cars and eight miscellaneous cars. The railroads on July 1 had 8,963 new freight cars on order, compared with 24,649 cars on the same day last year. The railroads also placed in service, in the first six months of this year, 89 new locomotives compared with 411 in the same period in 1930 and 319 in the same period in 1929. New locomotives on order on July 1 this year totaled 36 compared with 364 on the same day last year. Freight cars or locomotives leased or otherwise acquired are not included in the above figures.

Indiana Scrap Rates on Classification Basis

New freight rates putting scrap iron on a classification basis may go into effect in Indiana at once, as the result of a decision made by the Indiana supreme court on July 25. The court affirmed a decision of the circuit court in Indianapolis in which the Indiana Public Service Commission was in effect upheld in its efforts to establish the new classification.

In 1929, the commission passed an order fixing new rates for shipments of scrap iron, which generally constituted a reduction, and the Baltimore & Ohio appealed. A demurrer of the commission was upheld by the circuit court on the ground that an appeal had not been taken in the specified time. Then the carriers appealed to the supreme court. The new rates, which O. R. Living-

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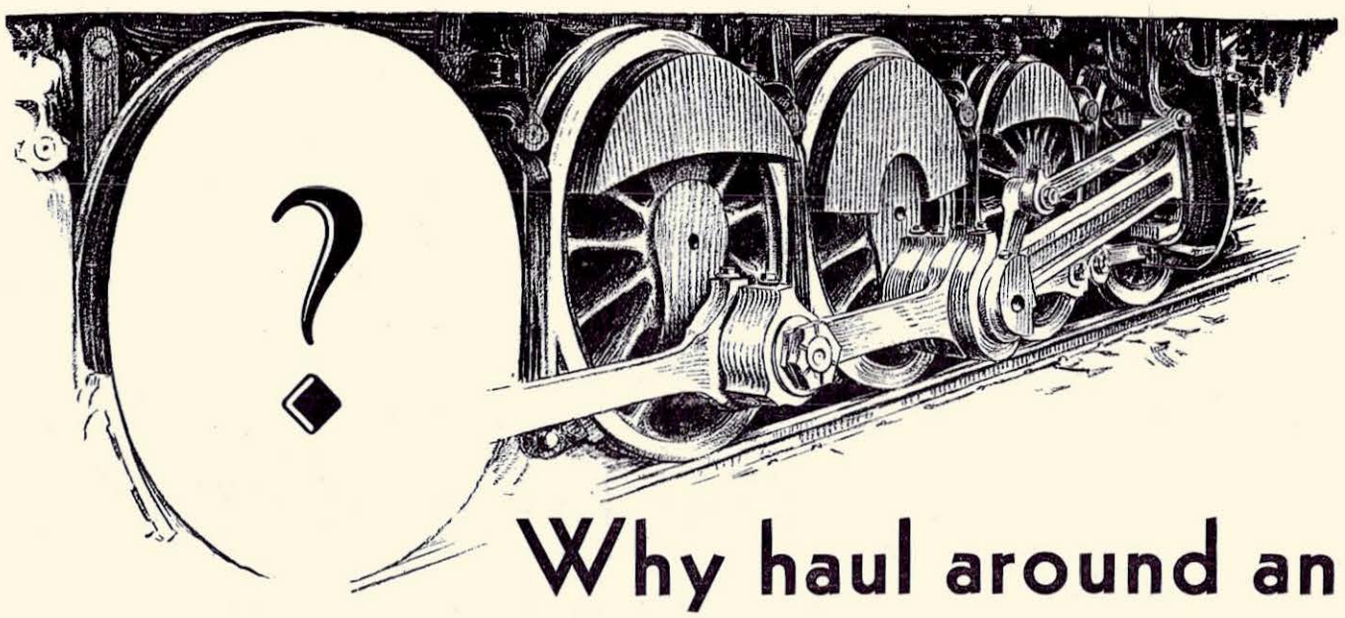


Why haul around an EXTRA *pair of drivers*

Only two ways exist for obtaining the extra power needed to set in motion the train that can then be hauled at speed.

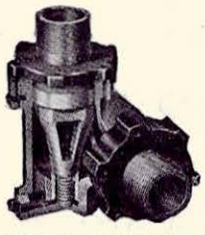
If an extra pair of drivers is added for this purpose, locomotive cost, operation and maintenance expense are needlessly increased.

When The Locomotive Booster is used, the added power is available when needed, but is inoperative when it has done its job of bringing the train to road speed.

The Booster is concentrated power; economical power—equivalent to that of an extra pair of drivers.

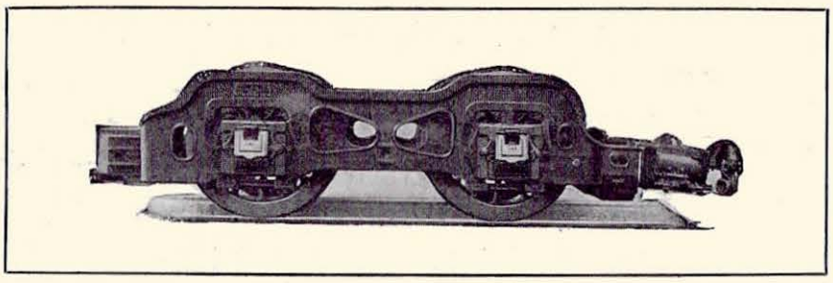
It is the most economical way of obtaining tractive power. Without it, far greater weight must be built into the locomotive, to be hauled around constantly in order to supply power that is needed only in starting and at slow speeds.

Half a cent per locomotive mile covers Booster maintenance. Compare this with the cost of added power obtained simply by adding weight to the locomotive.



THE FRANKLIN SLEEVE JOINT

A reliable conduit, free from limitations in movement, permitting short vertical pipes and greater rail clearance.



■ *For existing locomotives, consider The Booster as a package of tractive power that may be quickly and inexpensively added—even in the roundhouse, instead of awaiting a shopping period.*

FRANKLIN RAILWAY SUPPLY COMPANY, Inc.

NEW YORK CHICAGO SAN FRANCISCO ST. LOUIS MONTREAL

"THE MAINE BULLET" Inaugurates A Faster Freight Service

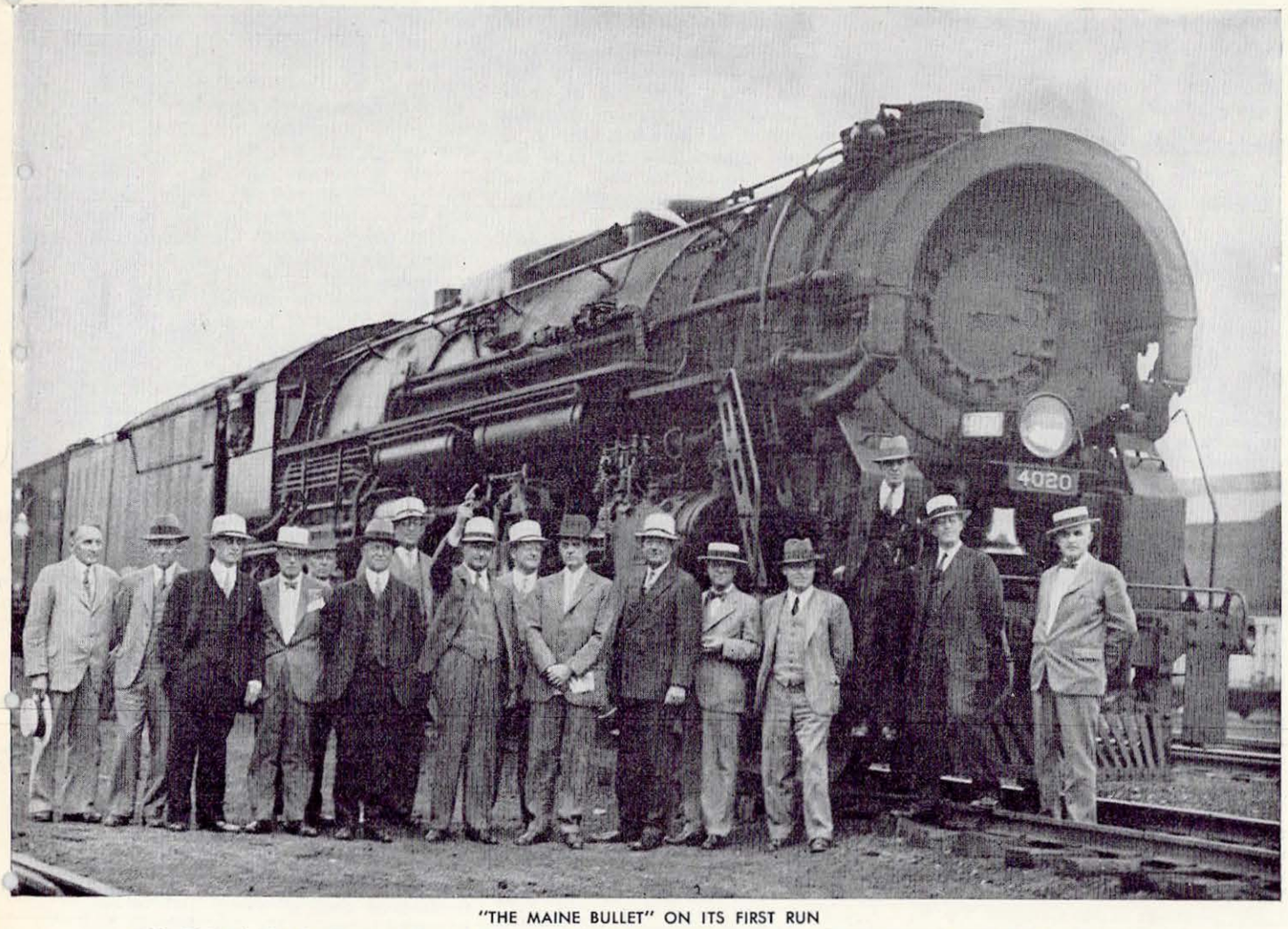
LIMA LOCOMOTIVE WORKS INCORPORATED

Lima Locomotives Provide the power that

PROGRESSIVE RAILROADS are merchandizers of transportation service. They give the shipper what he wants. In line with this policy the Boston and Maine, in cooperation with the New Haven, has just inaugurated a fast freight service between Portland, Me. and New York City.

Coordinated highway truck service to and from concentration points picks up freight in the afternoon, delivers it to the cities where "The Bullet" stops, and the next morning it is in the railroad yards in New York. The train provides over night service to and from New York from practically all New England points.

LIMA LOCOMOTIVE WORKS



"THE MAINE BULLET" ON ITS FIRST RUN

Mr. J. W. Smith, Vice-President and General Manager of the Boston and Maine Railroad firing the gun that inaugurated the service.

hauls freights on passenger schedule

Careful coordination and planning are an essential in such service, but equally important is adequate motive power. Old locomotives lack the sustained power output for such work.

Lima-built 2-8-4 type locomotives enable the Boston and Maine to maintain passenger speeds on this newest freight run—and do it day after day with dependability and economy.

More of these improvements in service are needed if the railroads are to defeat competition. This in turn requires modern Super-Power.

Incorporated · LIMA · OHIO

house, chief of the traffic department of the Public Service Commission, states may be put in effect at once unless the railroads take further legal action, are 17 per cent of the first-class rate.

Illinois Chamber of Commerce Favors Rate Plea

The Illinois Chamber of Commerce, on July 24, passed a resolution asking the Interstate Commerce Commission to give serious consideration to the application for a general increase in freight rates. The resolution, in part, follows:

"The Illinois Chamber of Commerce has repeatedly declared that the rates charged for transportation should yield an adequate return on the fair value of the property used by the railroads for transportation. It is not the province of this organization, nor do we presume to attempt to determine what exact percentage of increase in freight rates should be accorded to the steam railroads by your body, but we do support such an increase as in the judgment of your body is reasonable in the circumstances and which will result in sufficient increased railroad revenue to insure the stabilization of railroad credit, permit of adequate rail transportation, and improve the general economic status."

Peace River Western Outlet

At a conference in the office of the Minister of Railways at Ottawa over a week ago between Hon. Robert Manion, the Minister, and Sir Henry Thornton, president of the Canadian National, and E. W. Beatty, president of the Canadian Pacific, the heads of the two roads told the government that if the latter insisted upon an early start in constructing a Pacific coast outlet for the Peace river area the government would have to build it.

Dr. Manion told the House of Commons at Ottawa last week, in reply to speeches by Alberta and British Columbia members, that they and their people would have to exercise more patience in this matter. Referring to the speech of Mr. Garland, which started this discussion on the Peace River outlet, the Minister said:—

"The hon. gentleman spoke as though it were only a matter of the government stepping in and building this immense project. He spoke as though the two railways had come to a decision as to what they wanted and it would be a simple matter for the government to raise the $40,000,000 with which to construct the outlet forthwith. The fact of the matter is, the railways have not come to any decision. It is true that the route referred to by the hon. gentleman, the Aggie-Obed route, was one of the early suggestions of the Canadian National. But the Canadian Pacific has submitted a report recently in which they take exception to that suggested route; they suggest a different one from the route proposed by the Canadian National. I submit that it is only fair to say that before the government takes any action in the matter the railways themselves should at least agree to something definite."

Hudson Bay Grain Test

The Canadian government is prepared to absorb any additional costs so that shippers of a test movement of grain through Churchill on Hudson Bay this autumn will enjoy the same rates as if they shipped through Montreal, Hon. Dr. Manion, Minister of Railways, said in the House of Commons at Ottawa last week replying to a question.

"I have requested western grain dealers," he said, "to submit any reasonable proposition they thought desirable for providing cargoes of grain for the test shipments on the basis of a freight rate not higher than the present through rates, the natural and intended inference being that we would absorb any difference in rates due to increased insurance or other charges. The only proposal I have yet received in reply has been one wire stating that 150,000 bushels of grain can be assured. This is only about half a cargo.

"If a proposition is made to the government to supply from one to three cargoes of grain for shipment via Churchill, the shipper to pay rates on the basis of present through rates from the Prairies to Europe via Montreal, the government will see that ships are available and absorb any difference due to insurance or other transportation charges. That surely is a fair proposal on the part of the government. Now instead of criticism or abuse let the grain trade or some responsible organization come forward with proposals."

Premier Bennett on C.N.R. Policy

Premier Bennett of Canada last week gave an indication on matters of policy in regard to the Canadian National, showing the present Government's attitude toward the road. He declared "no change in policy can ever take place in respect to this publicly owned property unless the people of Canada, speaking through this Parliament, so determine, and there has been no evidence of that, so far as I have seen." Some of his remarks related to two preceding speeches, one by John T. Hackett, a Quebec Conservative, who made his second fierce attack of the session on the Canadian National, and another by Hon. William D. Euler, a former Liberal Cabinet Minister from Ontario, who is a vigorous advocate of public ownership as applied to the national railway system.

Premier Bennett dealt in particular with the entry of the Canadian National Steamships into the so-called triangular service on the Pacific coast, between Vancouver, Victoria and Seattle. This service had previously been solely provided by the Canadian Pacific. The entry of the government line with three new steamships complicated the situation and the Prime Minister had much to say on this:

"Since I have had the responsibilities of office no matter has given me more concern or pressed more heavily upon me than has the railway situation in Canada. I do think, as I have so frequently said, that it is time hon. members studied the situation in all its ramifications; for we are a people only 10,000,000 in number with railway facilities far beyond our requirements. We have an enterprise owned by the people of Canada who acquired it under circumstances to which I shall not refer this afternoon. In competition with a privately owned road they have endeavored to maintain that railway system. They have placed money into its operation with great freedom and willingness; they have backed it with a courage and determination which I think at least has satisfied those who had to administer the railroad that nothing any government has done in this country has stood in the way of every reasonable effort being made to advance the fortunes of the railroad. When the opportunity comes to discuss the affairs of the railway company I am sorry to find that there is a group which thinks that any criticism constitutes adverse criticism of the ownership of the road. That has not been so.

"I think if the house will take the trouble to analyze what has been done since the present government came into office and the effort it has made to maintain the integrity of the property consistently with the obligations which in the end must be borne by the Canadian people, hon. members will be satisfied that no step has been taken other than for the purpose of advancing its well being and proper management. It does not follow, however, that in so doing hon. members will agree wholly with everything that has been done; for certainly there are many hon. members who will join in the criticisms urged in the report with respect to those three steamships on the Pacific coast. The answer is, however, that this parliament agreed to their operation. It is much to be regretted that we have those three vessels losing such tremendous sums of money and serving no useful purpose. My only difficulty has been to understand how it was possible that they should have been constructed. They are there, however, and we have to deal with the situation as it exists."

The C. N. R. in June

Economies made effective in the operation of the Canadian National reduced operating expenses for June 1931, by $1,819,625 from the operating expenses of the corresponding month of 1930, according to the monthly statement of revenues and expenses. During the period from January 1 to June 30, operating expenses show a reduction of $11,570,590 as compared with the expenses of the first six months of 1930.

Gross revenues of the system, excluding Eastern lines, for the month of June were $15,236,230, a decrease of $4,169,498 from the gross of June, 1930. Operating expenses for June, 1931, were $15,341,235, a reduction of $1,819,625 from the expenses of June last year, leaving a net revenue deficit of $105,005, a decrease of $2,349,872 from the net of June, 1930.

For the six months period, January to June, gross revenues were $88,275,626, a decrease of $21,635,465 as compared with the same period of 1930. Operating expenses for the six months of 1931 were $86,946,590, a reduction of $11,570,590 as compared with the 1930 period, and net earnings for the six months of 1931 were $1,329,035, a decrease of $10,064,-

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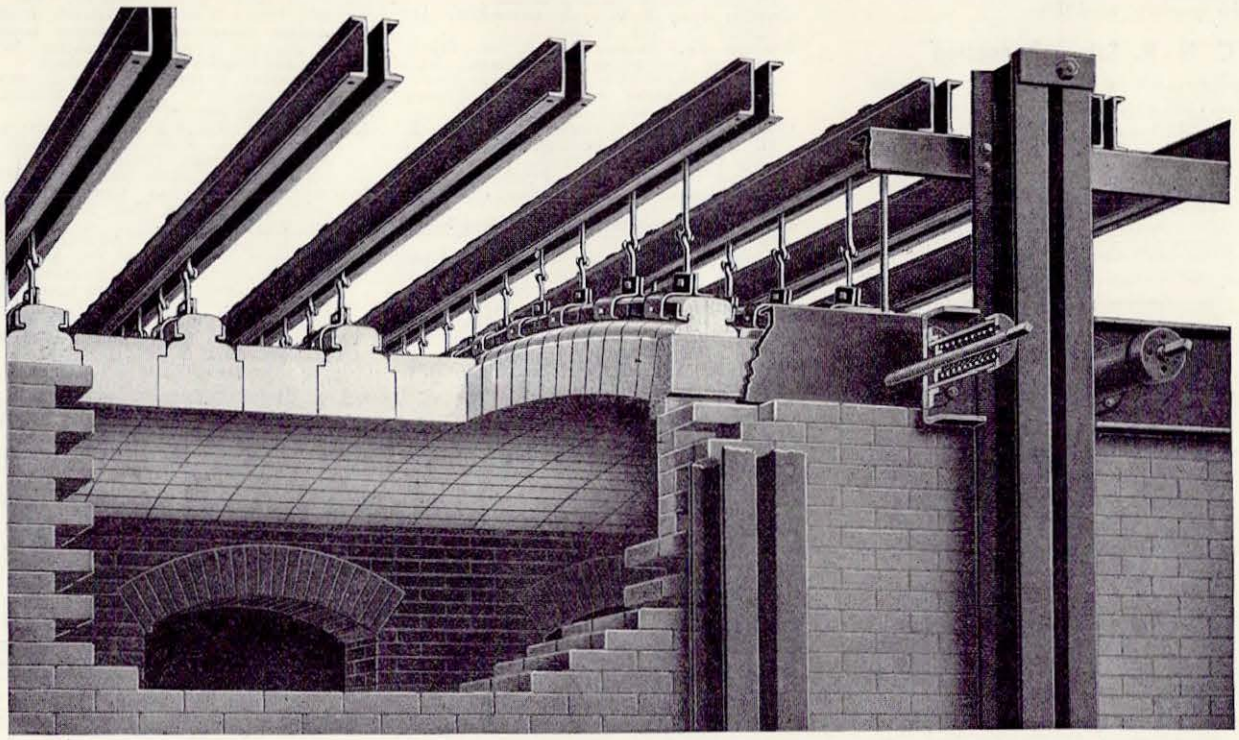
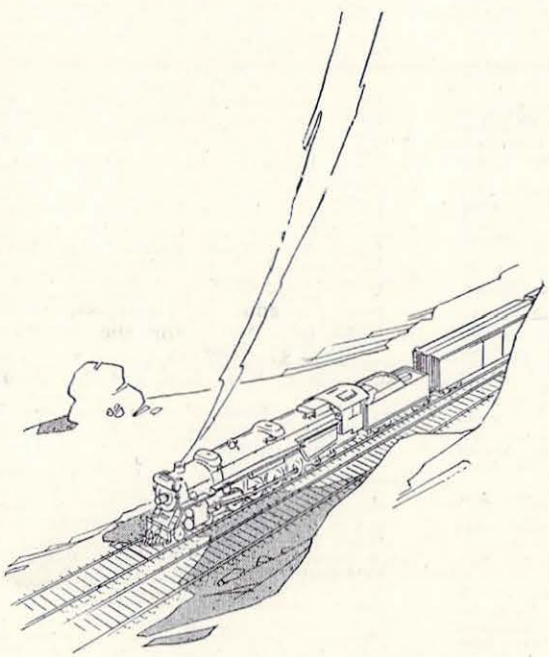


American Suspended Open Hearth Roof

From Locomotives *to* Oil Stills *and* Heating Furnaces

. . . American Arch Company is serving all industry with its combustion counsel



A GENERATION of railroad men have relied upon American Arch Company for design and engineering counsel.

Now all industry is calling on American Arch Company's combustion experience.

Great heating furnaces in the country's biggest steel plants; oil stills in the foremost oil refineries; boiler plants of the leading central stations.

These and many other industries have come to American Arch Company for roofs, walls and arches.

Yet, engineering and design is only one of the elements of American Arch Company service that has made it the accepted source of arch brick supply.

AMERICAN ARCH COMPANY

Incorporated

NEW YORK CHICAGO

874 as compared with the net for the first six months of 1930.

C. N. R. Salary Reduction

In connection with the announcement of a ten per cent cut in salaries on the Canadian National Railways, affecting all salaries in excess of $3,600 per year during the next ten months from August 1, Sir Henry Thornton, chairman and president of the Canadian National said in Montreal that the reduction, despite his contract with the government definitely fixing his compensation, nevertheless included himself, and also all the higher officers of the system.

Defending salary cuts of 10 per cent affecting all employees earning more than $3,600 a year, Sir Henry said that those who received in excess of that sum were better able to meet the reduction than lower salaried employees.

"We felt that it was perhaps unfair, and would cause undue distress," he said, "to those receiving $3,600 to make them subject to the decrease."

Replying to criticism of the system, Sir Henry pointed out that expenses had dropped since 1922, although revenue was practically unchanged. "In 1930 our gross earnings were slightly less than 1922, but our expenses were $17,000,000 less than 1922," he said. "If you take into consideration the increase in salaries and the reduction in freight rates since that period, our expenses are some $22,000,000 less than in 1922."

Meetings & Conventions

The following list gives names of secretaries, date of next or regular meetings and places of meetings.

RAILWAY ACCOUNTING OFFICERS' ASSOCIATION.—E. R. Woodson, 1124 Woodward Building, Washington, D. C. Next convention, 1932, Buffalo, N. Y.

AIR BRAKE ASSOCIATION—T. L. Burton, Room 5605, Grand Central Terminal Building, New York City.

ALLIED RAILWAY SUPPLY ASSOCIATION.—F. W. Venton, Crane Company, 836 S. Michigan Blvd., Chicago. To meet with Air Brake Association, Car Department Officers Association, International Railroad Master Blacksmiths' Association, International Railway Fuel Association, International Railway General Foremen's Association, Master Boiler Makers Association and the Traveling Engineers' Association.

AMERICAN ASSOCIATION OF FREIGHT TRAFFIC OFFICERS.—W. R. Curtis, F. T. R., M. & O. R. R., Chicago, Ill.

AMERICAN ASSOCIATION OF GENERAL BAGGAGE AGENTS.—E. L. Duncan, 332 S. Michigan Ave., Chicago.

AMERICAN ASSOCIATION OF PASSENGER TRAFFIC OFFICERS.—W. C. Hope, C. R. R. of N. J. 143 Liberty St., New York. Next Convention, October 20-21, 1931, Edgewater Beach Hotel, Chicago.

AMERICAN ASSOCIATION OF RAILROAD SUPERINTENDENTS.—F. O. Whiteman, Room 800, 1017 Olive St., St. Louis, Mo. Next meeting, 1932, Detroit, Mich.

AMERICAN ASSOCIATION OF SUPERINTENDENTS OF DINING CARS.—F. R. Borger, C. I. & L. R. R., 836 Federal St., Chicago. Next convention, October 20-22, 1931, Baltimore, Md.

AMERICAN ELECTRIC RAILWAY ASSOCIATION.—Guy C. Hecker, 292 Madison Ave., New York. Next convention, September 26-October 2, 1931, Auditorium, Atlantic City, N. J.

AMERICAN RAILWAY ASSOCIATION.—H. J. Forster, 30 Vesey St., New York, N. Y.
- Division I.—Operating.—J. C. Caviston, 30 Vesey St., New York, N. Y.
- Freight Station Section. — R. O. Wells, Freight Agent, Illinois Central Railroad. Chicago.
- Medical and Surgical Section.—J. C. Caviston, 30 Vesey St., New York.
- Protective Section.—J. C. Caviston, 30 Vesey St., New York.
- Safety Section.—J. C. Caviston, 30 Vesey St., New York.
- Telegraph and Telephone Section.—W. A. Fairbanks, 30 Vesey St., New York.
- Division II.—Transportation.—G. W. Covert, 59 East Van Buren St., Chicago.
- Division III.—Traffic.—J. Gottschalk, 143 Liberty St., New York.
- Division IV.—Engineering.—E. H. Fritch, 59 East Van Buren St., Chicago. Next meeting, March 15-17, 1932, Palmer House, Chicago. Exhibit by National Railway Appliances Association.
- Construction and Maintenance Section.—E. H. Fritch. Next meeting, March 15-17, 1932, Palmer House, Chicago.
- Electrical Section.—E. H. Fritch.
- Signal Section.—R. H. C. Balliet, 30 Vesey St., New York.
- Division V.—Mechanical.—V. R. Hawthorne, 59, East Van Buren St., Chicago.
- Equipment Painting Section.—V. R. Hawthorne, 59 East Van Buren St., Chicago.
- Division VI.—Purchases and Stores.—W. J. Farrell, 30 Vesey St., New York, N. Y.
- Division VII.—Freight Claims.—Lewis Pilcher, 59 East Van Buren St., Chicago.
- Division VIII.—Motor Transport.—George M. Campbell, 30 Vesey St., New York, N. Y. Annual Meeting, October 27-28, 1931, Chicago.
- Car Service Division.—C. A. Buch, 17th and H. Sts., N. W., Washington, D. C.

AMERICAN RAILWAY BRIDGE AND BUILDING ASSOCIATION.—C. A. Lichty, C. & N. W. Ry., 319 N. Waller Ave., Chicago. Next convention, October 20-21, 1931, Chicago. Exhibit by Bridge and Building Supply Men's Association.

AMERICAN RAILWAY DEVELOPMENT ASSOCIATION.—A. W. Large, Gen. Agri. Agt., C. R. I. & P. Ry., Chicago, Ill. Next meeting, 1932, Louisville, Ky.

AMERICAN RAILWAY ENGINEERING ASSOCIATION.—Works in co-operation with the American Railway Association, Division IV.—E. H. Fritch, 59 East Van Buren St., Chicago. Next meeting, March 15-17, 1932, Palmer House, Chicago. Exhibit by National Railway Appliances Association.

AMERICAN RAILWAY MAGAZINE EDITORS ASSOCIATION.—Miss E. Kramer, M-K-T Employes Magazine, St. Louis, Mo. Next convention, April, 1932, San Antonio, Tex.

AMERICAN RAILWAY TOOL FOREMEN'S ASSOCIATION.—G. G. Macina, C., M., St. P. & P. R. R., 11402 Calumet Ave., Chicago. Exhibit by Supply Association of the American Railway Tool Foremen's Association.—E. E. Caswell, Union Twist Drill Co., 11 S. Clinton St., Chicago.

AMERICAN SHORT LINE RAILROAD ASSOCIATION.—R. E. Schindler, Secretary, Union Trust Bldg., Washington, D. C.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—Calvin W. Rice, 29 W. 39th St., New York. Railroad Division, Paul D. Mallay, Johns-Manville Corp., 292 Madison Ave., New York.

AMERICAN WOOD PRESERVERS' ASSOCIATION.—H. L. Dawson, 1104 Chandler Building, Washington, D. C. Next meeting, January 26-28, 1932, Hotel Jefferson, St. Louis, Mo.

ASSOCIATION OF RAILWAY CLAIM AGENTS.—H. D. Morris, District Claim Agent, Northern Pacific Ry., St. Paul, Minn. Annual convention, May, 1932, Louisville, Ky.

ASSOCIATION OF RAILWAY ELECTRICAL ENGINEERS.—Jos. A. Andreucetti, C. & N. W., Room 411, C. & N. W. Station, Chicago. Exhibit by Railway Electrical Supply Manufacturers' Association.

ASSOCIATION OF RAILWAY EXECUTIVES.—Stanley J. Strong, Transportation Building, Washington, D. C.

BRIDGE AND BUILDING SUPPLY MEN'S ASSOCIATION.—S. A. Baber, High Grade Manufacturing Co., 10418 St. Clair Ave., Cleveland, Ohio. Meets with American Railway Bridge and Building Association.

CANADIAN RAILWAY CLUB.—C. R. Crook, 2276 Wilson Ave., N. D. G., Montreal, Que. Regular meetings, 2nd Monday in each month, except June, July and August, Windsor Hotel, Montreal, Que.

CAR DEPARTMENT OFFICERS ASSOCIATION.—A. S. Sternberg, M. C. B. Belt Ry. of Chicago, 7926 South Morgan Street, Chicago.

CAR FOREMEN'S ASSOCIATION OF CHICAGO.—G. K. Oliver, 2514 W. 55th St., Chicago. Regular meetings, 2nd Monday in month, except June, July, and August, Great Northern Hotel, Chicago.

CAR FOREMEN'S ASSOCIATION OF LOS ANGELES.—J. W. Krause, Room 299, 610 So. Main St., Los Angeles, Cal. Regular meetings, 2nd Monday of each month, except July, August and September, Room 299, 610 So. Main St., Los Angeles.

CAR FOREMEN'S ASSOCIATION OF ST. LOUIS, MO.—F. G. Wiegman, 720 N. 23rd St., East St. Louis, Ill. Meetings first Tuesday of each month, except June, July and August, American Hotel Annex, 6th and Market Sts., St. Louis, Mo.

CENTRAL RAILWAY CLUB OF BUFFALO.—T. J. O'Donnell, 1817 Hotel Statler, McKinley Square, Buffalo, N. Y. Regular meetings, 2nd Thursday each month, except June, July, August, Hotel Statler, Buffalo, N. Y.

CINCINNATI RAILWAY CLUB.—D. R. Boyd, 453 E. 6th St., Cincinnati, Ohio. Meetings 2nd Tuesday in February, May, September and November.

CLEVELAND RAILWAY CLUB.—F. L. Frericks, 14416 Alder Ave., Cleveland, Ohio. Meetings, second Monday each month, except July, August, September, Auditorium, Brotherhood of Railroad Trainmen's Building, West 9th St., and Superior Ave., Cleveland.

INTERNATIONAL RAILROAD MASTER BLACKSMITHS' ASSOCIATION.—W. J. Mayer, Michigan Central R. R., Detroit, Mich.

INTERNATIONAL RAILWAY FUEL ASSOCIATION.—C. T. Winkless, Room 700 La Salle Street Station, Chicago. Annual meeting, September 15-16, 1931, Hotel Sherman, Chicago.

INTERNATIONAL RAILWAY GENERAL FOREMEN'S ASSOCIATION.—Wm. Hall, 1061 W. Wabasha St., Winona, Minn.

MASTER BOILER MAKERS ASSOCIATION.—A. F. Stiglmeier, 29 Parkwood St., Albany, N. Y.

MASTER CAR BUILDERS' AND SUPERVISORS' ASSOCIATION.—(See Car Department Officers' Association.)

NATIONAL ASSOCIATION OF RAILROAD AND UTILITIES COMMISSIONERS.—James B. Walker, 270 Madison Ave., New York. Annual convention, October 20-23, 1931, Jefferson Hotel, Richmond, Va.

NATIONAL ASSOCIATION OF RAILROAD TIE PRODUCERS.—Roy. M. Edmonds, 1252 Syndicate Trust Bldg., St. Louis, Mo.

NATIONAL RAILWAY APPLIANCES ASSOCIATION.—C. W. Kelly, 1014 South Michigan Ave., Chicago. Exhibit at A. R. E. A. convention.

NATIONAL SAFETY COUNCIL.—Steam Railroad Section: J. L. Walsh, Supt. Safety, M.-K.-T. R. R., Dallas, Tex. Annual congress October 12-16, 1931, Hotel Stevens, Chicago.

NEW ENGLAND RAILROAD CLUB.—W. E. Cade, Jr., 683 Atlantic Ave., Boston, Mass. Regular meetings, 2nd Tuesday in month, except June, July, August and September, Copley Plaza Hotel, Boston, Mass.

NEW YORK RAILROAD CLUB.—D. I. McKay, 26 Cortlandt St., New York. Regular meetings, 3rd Friday in month, except June, July and August, 29 W. 39th St., New York City.

PACIFIC RAILWAY CLUB.—W. S. Wollner, P. O. Box, 3275, San Francisco, Cal. Regular meetings 2nd Thursday in month, alternately in San Francisco and Oakland.

RAILWAY BUSINESS ASSOCIATION. — Frank W. Noxon, 1112 Shoreham Building, Washington, D. C.

RAILWAY CLUB OF PITTSBURGH.—J. D. Conway, 1841 Oliver Building, Pittsburgh, Pa., Regular meetings, 4th Thursday in each month except June, July and August, Fort Pitt Hotel, Pittsburgh, Pa.

RAILWAY ELECTRICAL SUPPLY MANUFACTURERS' ASSOCIATION.—Edward Wray, 9 S. Clinton St., Chicago. Meets with Association of Railway Electrical Engineers.

RAILWAY FIRE PROTECTION ASSOCIATION.—R. R. Hackett, Baltimore & Ohio R. R. Baltimore, Md.

RAILWAY SUPPLY MANUFACTURERS' ASSOCIATION.—J. D. Conway, 1841 Oliver Bldg., Pittsburgh, Pa. Meets with Mechanical Division. Purchases and Stores Division and Motor Transport Division, American Railway Association. (No exhibit at 1931 meetings.)

RAILWAY TELEGRAPH AND TELEPHONE APPLIANCE ASSOCIATION.—G. A. Nelson, 30 Church St., New York. Meets with Telegraph and Telephone Section of A. R. A. Division 1.

RAILWAY TREASURY OFFICERS' ASSOCIATION.—L. W. Cox, 1217 Commercial Trust Bldg., Philadelphia, Pa. Next convention, September 17-18, 1931, Statler Hotel, Buffalo, N. Y.

ROADMASTERS' AND MAINTENANCE OF WAY ASSOCIATION. — T. F. Donahoe, Gen. Supvr. Road, Baltimore & Ohio, Pittsburgh, Pa. Next convention, September 22-24, 1931, Hotel Stevens, Chicago. Exhibit by Track Supply Association.

ST. LOUIS RAILWAY CLUB.—B. W. Frauenthal, Drawer 24, M. P. O., St. Louis, Mo. Regular meetings, 2nd Friday in month, except June, July and August. Statler Hotel, St. Louis.

SIGNAL APPLIANCE ASSOCIATION.—F. W. Edmunds, West Nyack (Rockland Co.), N. Y. Meets with A. R. A. Signal Section.

SOUTHERN AND SOUTHWESTERN RAILWAY CLUB.—A. T. Miller, P. O. Box 1205, Atlanta, Ga. Regular meetings, 3rd Thursday in January, March, May, July, September and November. Ansley Hotel, Atlanta.

SOUTHERN ASSOCIATION OF CAR SERVICE OFFICERS.—R. G. Parks, A. B. & C. Ry., Atlanta, Ga.

SUPPLY MEN'S ASSOCIATION.—E. H. Hancock, Treasurer, Louisville Varnish Co., Louisville, Ky. Meets with A. R. A. Div. V. Equipment Painting Section.

TORONTO RAILWAY CLUB.—J. A. Murphy, 1405 Canadian National Express Building, Toronto. Regular meetings 3rd Monday of each month, except June, July and August, Royal York Hotel, Toronto, Ont.

TRACK SUPPLY ASSOCIATION.—L. C. Ryan, Oxweld Railroad Service Co., Carbon & Carbide Building, Chicago. Meets with Roadmasters' and Maintenance of Way Association.

TRAVELING ENGINEERS' ASSOCIATION. — W. O. Thompson, 1177 East 98th St., Cleveland, O.

WESTERN RAILWAY CLUB.—J. H. Nash, Dri-Steam Valve Sales Corp., 122 S. Michigan Ave., Chicago. Regular meetings 3rd Monday each month, except June, July, August and September, Hotel Sherman, Chicago.

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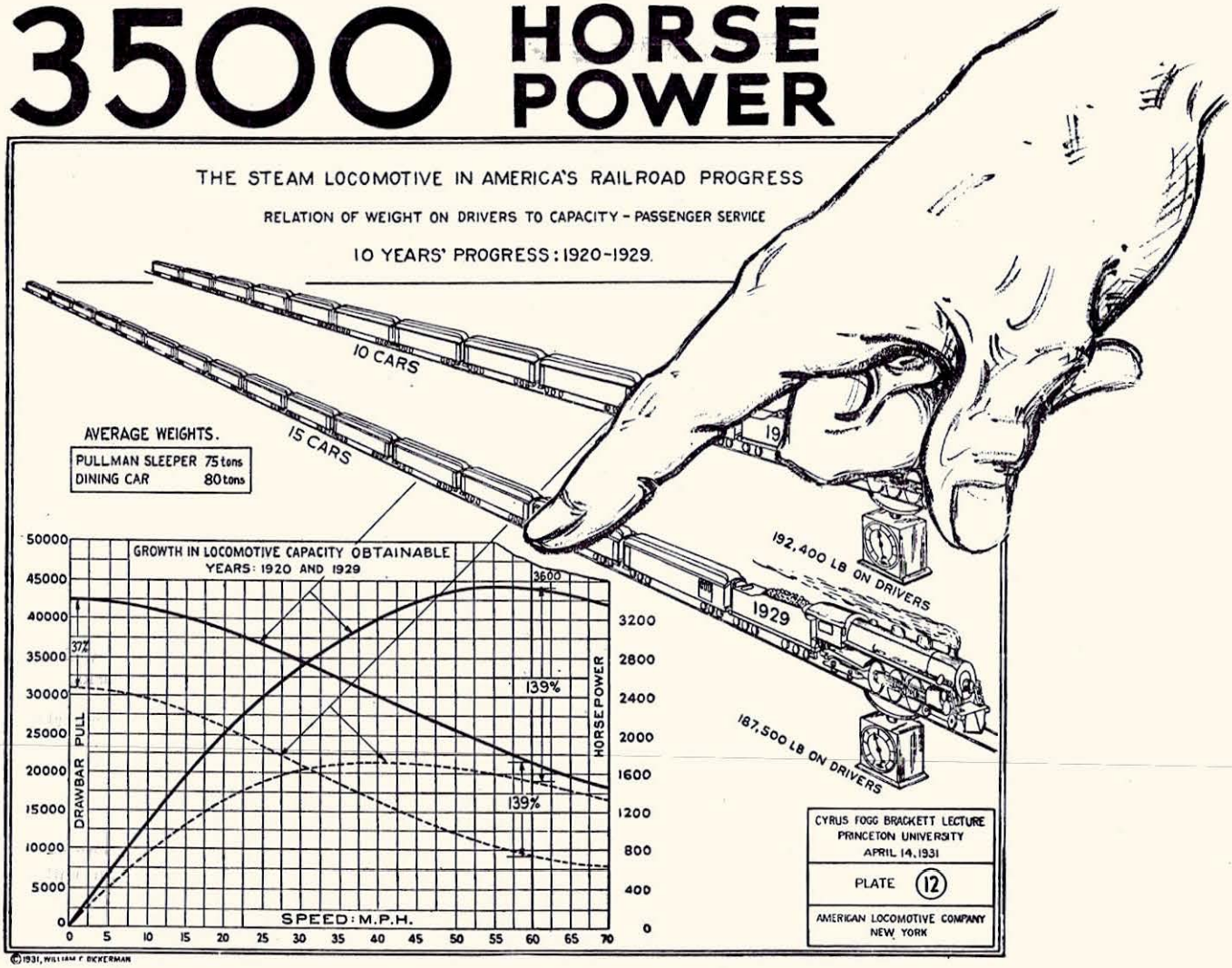
3500 HORSE POWER



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To Economize Modernize

More Than Twice the Power Capacity of the 10 - Year - Old Locomotive—

THINK of it—3500 hp. as against only 1500 hp; 37 per cent more drawbar pull at starting; 139 per cent more drawbar pull at passenger express speed of 60 miles per hour. That shows how vastly superior a 1929 locomotive proved itself over a 1920 locomotive in the same passenger service on the same railroad. Both locomotives are actual cases. The curves in the above graph represent their actual performance, the dotted curves represent the performance of the 1920 locomotive and the solid curves that of the 1929 locomotive.

How did the modern locomotive save money and improve operating efficiency?

The 1929 locomotive now hauls 15 Pullmans instead of 10 at no sacrifice in speed. The longer trains reduced the number of sections on limited trains during times of heavy traffic. Fewer diners are now necessary. Two trains are often combined into one. That reduces costs and increases track capacity. It adds safety for it increases the headway between trains.

Are you capitalizing on the big advantages of the modern locomotive? It pays to modernize. The profits now lost will pay the cost.

American Locomotive Company
30 Church Street New York N.Y.

Equipment and Supplies

FREIGHT CARS

THE SAVANNAH & ATLANTA has placed an order for six steel underframes for caboose cars.

THE CARNEGIE STEEL COMPANY has received revised prices on its inquiry for 30 new hopper car bodies and for repairs to 30 H-21 type hopper cars.

THE NORFOLK & WESTERN has ordered 1,700 tons of plates, shapes and bars from the Carnegie Steel Company for 450 hopper cars to be built in the railroad's shops. It has also ordered 500 tons of steel for parts from the American Car & Foundry Company, and 200 tons of shapes from the Virginia Bridge & Iron Company.

PASSENGER CARS

THE ATCHISON, TOPEKA & SANTA FE is inquiring for one gas-electric rail motor car 80 ft. long.

IRON & STEEL

THE TEXAS & PACIFIC has ordered 700 tons of structural steel for a trainshed at Dallas, Tex., from the Mosher Steel & Machinery Co.

THE SOUTHERN PACIFIC has ordered 240 tons of structural steel for bridge work at San Francisco, Cal., from the Virginia Bridge & Iron Co.

THE NEW YORK, CHICAGO & ST. LOUIS has ordered 825 tons of structural steel for a bridge at Toledo, Ohio, from the American Bridge Company.

THE BIRMINGHAM SOUTHERN has ordered 100 tons of structural steel for bridge work in Birmingham, Ala., from the Virginia Bridge & Iron Co.

THE CHICAGO, MILWAUKEE, ST. PAUL & PACIFIC has ordered 100 tons of structural steel for miscellaneous bridge work from the Wisconsin Bridge & Iron Co.

THE CHICAGO, BURLINGTON & QUINCY has ordered 450 tons of structural steel for bridge work at St. Louis, Mo., from the American Bridge Co., and 500 tons from the McClintic-Marshall Corp.

THE NEW YORK CENTRAL has ordered from the American Bridge Company 425 tons of steel for grillage work at Thirtieth street, New York, in connection with West Side grade crossing elimination work; and from the Harris Structural Steel Company 320 tons of steel for a new bridge at Woodlawn, N. Y.

THE WABASH has ordered 676 tons of structural steel for grade separation work at Toledo, Ohio, the distribution being as follows: 314 tons for the Glendale avenue separation and 102 tons for the Woodsdale avenue separation from the American Bridge Company, and 260 tons for the Detroit avenue separation from the McClintic-Marshall Corporation.

SIGNALING

THE BOARD OF TRANSPORTATION OF THE CITY OF NEW YORK has awarded to the Union Switch & Signal Company equipment contract S-3, involving the installation of automatic block signal and interlocking equipment on the subway system of city-owned rapid transit lines between Fulton street, Manhattan, and Church avenue, Brooklyn. This section includes approximately 25 miles of track. The work includes 500 color-light signals, 50 electro-pneumatic switches and 332 electro-pneumatic train stops. Approximately half of these signals and all the switches will be controlled by four electro-pneumatic interlocking machines totaling 140 levers.

Supply Trade

R. E. Condit has been appointed representative of the **Northern Engineering Works,** Detroit, Mich., for the Cincinnati and Columbus districts, with offices at 705 Gwynne building, Cincinnati, and 901 E. Third street, Dayton, Ohio. **The Hill Equipment & Engineering Company,** St. Louis, Mo., has been appointed representative in the latter territory.

Charles P. Whitehead, sales assistant to the vice-president and general manager of the **General Steel Castings Corporation,** Granite City, Ill., has been promoted to manager of sales, with headquarters at Eddystone, Pa. **William M. Sheehan,** sales assistant to the vice-president and general manager, with headquarters at Eddystone, Pa., has been appointed manager of the Eastern district sales, with the same headquarters. **Harry R. Bartell,** sales engineer, has been promoted to manager of the Western district sales, with headquarters at Granite City. **E. J. Birtwell** continues as district manager of miscellaneous sales, with headquarters at Eddystone.

The General Machinery Corporation, Hamilton, Ohio, has acquired the business of the **Putnam Machine Company,** Fitchburg, Mass., formerly owned by Manning, Maxwell & Moore, Inc. The Putnam line of products will continue to be manufactured at the General Machinery Corporation's plants as supplementary to the line of The Niles Tool Works Company, another subsidary of General Machinery Corporation. The company will furnish, and solicits repairs for, all existing Putnam, Dietrich & Harvey, and Beaman & Smith installations. The business will in future be conducted as the Putnam Machine Company, division of General Machinery Corporation. **G. A. Rentschler,** president of the General Machinery Corporation, is also president of Putnam Machine Company.

Charles D. MacGillivray, assistant secretary of the **Baldwin Locomotive Works,** has been elected secretary to succeed **Arthur L. Church,** deceased, and **J. Harrison Kerst** has been elected assistant secretary, both with headquarters at Eddystone, Pa; they were also elected to similar positions with two Baldwin subsidiary companies, the Standard Steel Works Company and the Baldwin-Southwark Corporation. Mr. MacGillivray was born at Cambridge, Mass.; after serving for five years as paymaster in the United States Navy, he became associated in 1923, as secretary with George H. Houston, now president of the Baldwin Locomotive Works. Mr. MacGillivray, for about a year, has served as assistant secretary of the Baldwin Locomotive Works. Mr. Kerst has been connected for many years with the Baldwin Locomotive Works.

L. A. Paddock, who has been elected president of the **American Bridge Company,** with headquarters at Pittsburgh, Pa., was born on February 20, 1879, at Pontiac, Mich., and was graduated from the University of Michigan with the degree of bachelor of science in civil engineeering. He began his engineering career in 1904 as a draftsman with the Canadian Bridge Company, Ltd., Walk-

L. A. Paddock

erville, Ont., and subsequently became superintendent, vice-president and general manager. He was president of that company from 1924 until his election as vice-president of the American Bridge Company in 1927. In addition to his new position as president of the American Bridge Company, Mr. Paddock is a director of that company and also a director of the Canadian Bridge Company, Ltd., and the Essex Terminal Railway.

TRADE PUBLICATION

THE CORNING GLASS WORKS, Corning, N. Y., has issued a 32-page catalogue on signal glassware for railroad and marine service.

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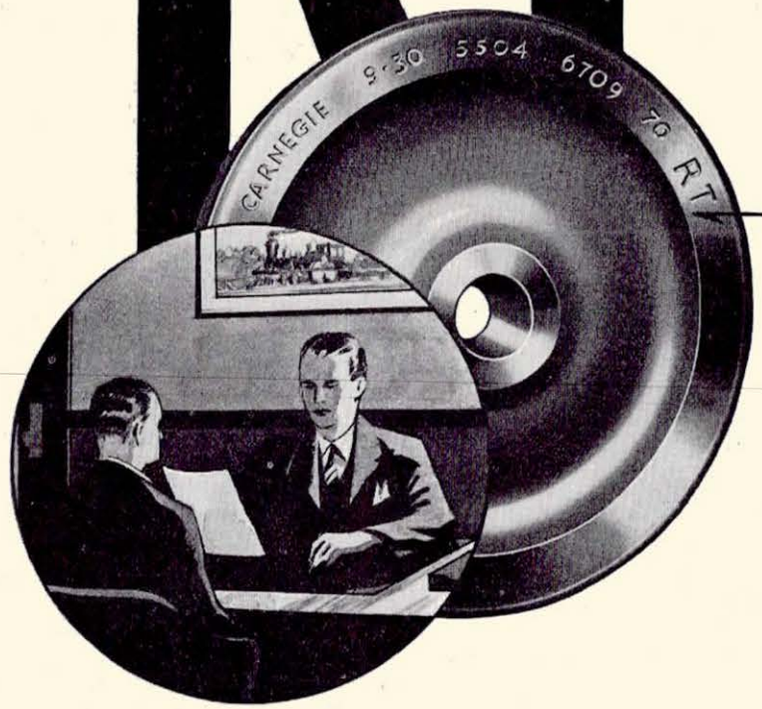
RT*



* The mark identifying wheels particularly adapted for modern heavy-duty service.

Two *important* letters in the Railroad Man's alphabet R T

The eighteenth and twentieth letters of the alphabet have taken on a new significance for the railroad man. Stamped on Carnegie Wrought Steel Wheels, the initials "R T" mean Rim-Toughened. They indicate the additional refinement of heat treatment, the process of which produces a wheel with an especially tough rim and with high physical properties . . . a wheel with the extra stamina to endure the stress and strain of modern heavy-duty service. Accurate machining insures perfect rotundity with a consequent increase in riding comfort.

Carnegie special rim-toughened wheels are furnished for passenger, engine truck and tender service. Carnegie Single-Life wheels, rim-toughened, are also available for 70-ton freight service. You already know the outstanding advantages of wrought steel. Learn now of this further improvement. Put your O K on R T wheel specifications and learn how friendly these initials are to your maintenance appropriation. Our wheel engineers will gladly bring you complete details.

CARNEGIE WROUGHT STEEL WHEELS

Product of Carnegie Steel Company, Pittsburgh, Pa. U S STEEL *Subsidiary of United States Steel Corporation* 150

Construction

ATCHISON, TOPEKA & SANTA FE.—Bids were received on July 27 for the construction of 13 street subways as a part of this company's track elevation program at Oklahoma City, Okla. All track work required on this project is to be undertaken by company forces.

ATCHISON, TOPEKA & SANTA FE—MISSOURI PACIFIC.—These roads and the Colorado State Highway department contemplate the construction of a highway subway about three miles east of Pueblo, Colo.

BOSTON & MAINE.—The reconstruction of the railroad bridge carrying this company's line over the Hoosick-North Hoosick county highway, Hoosick, N. Y., has been ordered by the Public Service Commission of New York.

CHESAPEAKE & OHIO.—This railroad has awarded to the Sturm & Dillard Company, Columbus, Ohio, a contract for the enlarging and relining of Kelly's tunnel, Jerrys Run, Va., at an approximate cost of $190,000. A contract for the construction of an undergrade crossing, to cost about $62,150, at South Charleston, W. Va., has been let to Langhorne & Langhorne, Huntington, W. Va., while another contract, amounting to $29,100 and covering similar work at Fishersville, Va., has been given to Haley, Chisholm & Morris, Charlottesville, Va.

DELAWARE & HUDSON.—The Broadway crossing of this company's tracks, Fort Edward, N. Y., has been designated for elimination by the New York Public Service Commission, by the construction of an underpass 50 ft. wide with a clearance of 14 ft.

KANSAS CITY SOUTHERN.—A contract has been awarded to the List Construction Company, Kansas City, Mo., for 50,000 cu. yd. of grading in connection with the construction of a storage yard aggregating 3.25 miles of track near Sugar Creek, a suburb of Kansas City, Mo. All bridge work and track laying will be undertaken by railway forces. The estimated cost of the project is $213,224, which includes the railway's proportion of the cost of a grade separation, to be undertaken by the State Highway Commission.

NEW ORLEANS PUBLIC BELT.—Bids for the construction of the $19,000,000 Public Belt railroad and highway bridge over the Mississippi river just above the New Orleans (La.) city limits, which were originally called for June 4 and subsequently postponed for an indefinite period, will be opened at New Orleans on September 15, according to a recent joint announcement by Governor Huey P. Long of Louisiana and Mayor T. Semmes Walmsley of New Orleans. It is expected that the bridge, when completed, will be used by the Southern Pacific and possibly by the Texas & Pacific. The bids will include four separate proposals, covering the substructure of the bridge, the bridge superstructure, the substructure of approaches and the superstructure of approaches. The state of Louisiana has applied $7,000,000 of its road bond issue to the bridge to take care of the highway portion of the structure, which will make New Orleans more easily accessible from the west bank of the river. The Public Belt bridge is not designed, however, to affect the proposed bridge across the Mississippi at Baton Rouge, La., both bridges being declared necessary to the development of the state, according to Governor Long and Mayor Walmsley. In connection with the construction of the New Orleans bridge, a board of engineers is to be appointed to make a study and survey of local freight terminals, based on the findings of the commercial affairs committee, with unifications as the ultimate purpose. When this board has completed its work its report will be submitted to the various railroads entering New Orleans for their consideration. Unification of rail and water terminal facilities, it is believed, will result in reduced charges and will attract additional commerce to the port.

NEW YORK CENTRAL (Ohio Central Lines).—A contract has been awarded to E. Elford & Son, Columbus, Ohio, for the construction of an addition to the inbound house of the former freight station at Columbus, at an estimated cost of $30,000.

NEW YORK CENTRAL.—The Public Service Commission of New York has approved as not excessive a bid submitted by the Walsh Construction Company, Syracuse, N. Y., for work in connection with the reconstruction of the bridge carrying River street, Nelliston, N. Y., over this company's tracks, and has also approved specifications and cost estimates for the elimination of a New York Central grade crossing located on the Watkins-Yates county line highway, Reading, N. Y.

NORTHERN PACIFIC.—The Great Northern has petitioned the Interstate Commerce Commission for a rehearing of the case in which the commission recently authorized this company to construct a 24-mile branch line from Woodrow, Mont., to Bloomfield.

NORTHERN PACIFIC.—Plans have been completed for the construction of a bascule bridge having a clear channel span of 150 ft. over the Duwamish River waterway, Seattle, Wash., to replace an existing structure having a clear span of 80 ft. The estimated cost of the project is $324,000. A contract for furnishing and erecting the material for the bascule span has been awarded to the Wallace Bridge & Structural Steel Co., Seattle, at an approximate cost of $138,000. Contracts for the foundation and other work will be let in the near future. This road has recently let contracts for the construction and installation of a steel coaling station, sanding facilities, water columns and other facilities at Dickinson, N. D., which work has a total estimated cost of $54,000. A contract for furnishing the structural steel necessary has been awarded to the Minneapolis Steel & Machinery Co., Minneapolis, Minn., at an approximate cost of $12,000. The Ogle Construction Company, Chicago, has the contract for furnishing all machinery, and Peppard & Fulton, Minneapolis, have been awarded a contract for erecting the steel. Contracts have also been let for the construction of a 500-ton steel coaling station at Benz, Mont., at an estimated cost of $31,250. Contracts for furnishing the structural steel and for supplying the machinery for this project have also been let to the Minneapolis Steel & Machinery Co., and the Ogle Construction Company, respectively. The approximate cost of these contracts is $12,000 each.

PENNSYLVANIA.—This road and the city of Louisville, Ky., have recently entered into an agreement for the elevation of a considerable mileage of the railway company's tracks in that city. To a lesser extent, the Illinois Central, the Louisville & Nashville, and the Louisville Railway Company, a street railway, are also involved in the agreement. The double-track line of the Pennsylvania occupies Fourteenth street in Louisville between the Ohio river on the north and Kentucky street on the south, a distance of about 1½ miles, and within these limits the line is to be raised on an earth fill an average of about 15 ft. The track elevation will require the construction of underpasses which will consist of solid deck bridges carried on concrete abutments, at nine cross streets. The project also involves the elevation and relocation of the Pennsylvania's double-track connection with the Louisville & Nashville. This line now occupies Maple street, but is to be removed to a location north of Kentucky street. The elevation of this connecting line involves the construction of two subways at street crossings. The project has a total estimated cost of between three and four million dollars, of which 65 per cent will be borne by the steam railways and 35 per cent by the city and the street railway. It is expected that work on the project will be started in the near future.

ST. LOUIS-SAN FRANCISCO.—Bids were received on July 31 for the construction of a reinforced concrete and steel grade separation structure to carry the four tracks of this company over Southwest avenue at Ivanhoe avenue, St. Louis, Mo. Contracts for the elevation of the tracks had been let previously. The complete cost of this project, which will be shared by the city of St. Louis, will be about $120,000, and the work involved in the bids received on July 31 will aggregate about $85,000.

SOUTHERN PACIFIC.—A contract has been awarded to the F. F. Greenfield Company, Los Angeles, Cal., for the construction of a reinforced concrete and plate girder viaduct to carry Victory place over this company's tracks at Los Angeles, at a cost of about $26,000.

UNION PACIFIC.—A contract has been awarded to the Utah Construction Company, Ogden, Utah, for the excavation of approximately 25,000 cu. yd. of loose rock in connection with the construction of an auxiliary creek channel and a dike in Devil's Gate canyon at Gateway, Utah, at an estimated expenditure of about $20,-

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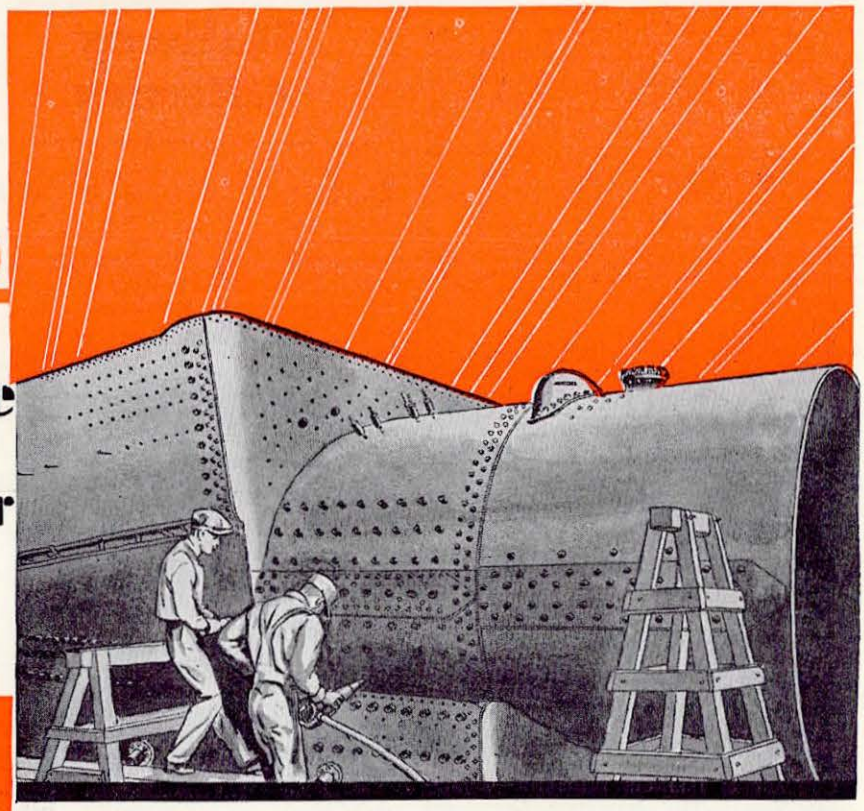
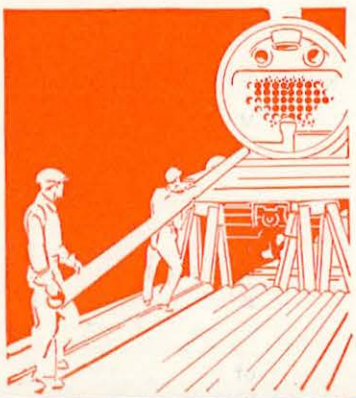
Build low maintenance into your boiler



AGATHON NICKEL IRON



● WHAT goes into the boiler today will determine the repair costs a few years hence.

Just as modern design has improved locomotive operation, so, too, modern metallurgy has improved boiler maintenance.

Modern boiler tubes of Toncan Iron, due to their superior resistance to corrosion and their uniform, seamless quality far outlast the old tubes.

Modern staybolts of Agathon Nickel Iron have the increased tensile strength required by present day boiler pressures. They are doubling the mileage per staybolt renewal for progressive railroads.

Firebox sheets of Toncan Iron resist corrosion and fire-cracking. This alloy of refined iron, copper and molybdenum has substantially extended the life of side sheets.

In these and many other instances, Republic metallurgists have developed special alloy irons and steels that are improving locomotive performance and lowering maintenance.

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GENERAL OFFICES: YOUNGSTOWN, OHIO

000. A contract for the construction of 756 linear ft. of reinforced concrete retaining wall 16 ft. high, and the installation of a fence, at Wallace, Idaho, has been awarded to Clifton, Applegate & Toole, Spokane, Wash., at a cost of slightly less than $22,000. The Union Pacific expects to ask for bids in the near future for the construction of a 30-ft. by 154-ft. brick and frame freight and passenger station at Pullman, Wash., to replace the present structure, which was constructed in 1886, the estimated cost of this work being $41,500. Using its own forces, the company now has under construction at Cheyenne, Wyo., a 20-stall enginehouse, at an estimated cost, complete, of $233,000.

Financial

BOSTON & MAINE.—*Bonds.*—The Interstate Commerce Commission has authorized the Peterborough & Hillsborough to extend for five years from July 1, 1931, the maturity dates of $100,000 of its first-mortgage 4½ per cent bonds.

CHICAGO & ILLINOIS MIDLAND.—*Equipment Notes.*—The Interstate Commerce Commission has authorized this company to issue $312,000 of 4½ per cent equipment notes, maturing serially between October 1, 1931, and April 1, 1936. The issue is payable to the Lima Locomotive Works.

DELAWARE, LACKAWANNA & WESTERN.—*Bonds.*—The Interstate Commerce Commission has authorized the Morris & Essex to issue $10,000,000 of 4½ per cent construction-mortgage, series C bonds, to be delivered at par to the Delaware, Lackawanna & Western, in partial reimbursement of expenditures for additions and betterments. The Delaware, Lackawanna & Western has been authorized to assume obligation as guarantor of the bonds.

NORTHWESTERN PACIFIC.—*Acquisition.*—This company has applied to the Interstate Commerce Commission for authority to acquire control of the Petaluma & Santa Rosa electric railway by purchase of all its stock, 8307 shares, at $90 a share.

ST. LOUIS SOUTHWESTERN.—*Bonds.*—The Interstate Commerce Commission has authorized this company to procure the authentication and delivery of $1,114,000 of first terminal and unifying mortgage bonds in partial reimbursement for capital expenditures.

Dividends Declared

Illinois Central.—Preferred, $3, semi-annually, payable September 1 to holders of record August 7; common, $1, quarterly, payable September 1 to holders of record August 7.

Average Prices of Stocks and of Bonds

	July 28	Last week	Last year
Average price of 20 representative railway stocks..	67.19	70.51	116.48
Average price of 20 representative railway bonds..	91.38	91.56	94.64

Railway Officers

Erie Moves Headquarters to Cleveland

The following table shows the names, titles, and present headquarters of Erie officers who will have been transferred, by August 18, to Cleveland, Ohio.

EXECUTIVE

Name	Title	Present Headquarters
C. E. Denney	president	New York
L. L. White	assistant to president	New York
P. Oberlin	assistant to vice-president	New York
G. H. Minor	vice-president and secretary	New York
D. L. Gray	vice-president (Traffic)	New York
C. L. Chapman	assistant to vice-president	New York
R. E. Woodruff	vice-president (Oper.)	New York
J. M. Condon	assistant vice-president	New York
R. C. Falconer	assistant vice-president (Engrg.)	New York
H. R. Cole	assistant to vice-president	New York

FINANCIAL, LEGAL AND ACCOUNTING

J. G. Walsh	treasurer	New York
E. F. Morgenroth	assistant treasurer	New York
G. A. W. Achenbach	assistant secretary	New York
H. A. Taylor	general counsel	New York
G. R. James	assistant general solicitor	New York
M. B. Pierce	general attorney	New York
H. H. Hull	general attorney	New York
H. T. Whipple	general attorney	New York
J. K. Thompson	comptroller	New York
T. J. Tobin	assistant comptroller	New York
A. J. Moran	assistant comptroller revenue	New York
J. Prigge	auditor revenue	New York
J. G. Austin	auditor disbursements	New York
A. L. Greenleaf	assistant auditor disbursements	New York

OPERATING

J. J. Moynihan	superintendent transportation	New York
P. W. Johnston	assistant superintendent transportation	New York
A. Rogers	inspector transportation	New York
L. V. R. Clum	car service agent	New York
A. E. Pasman	freight claim agent	New York
J. N. Brundage	assistant freight claim agent	New York
R. T. Post	assistant freight claim agent	New York
J. A. Waddell	superintendent property protection	New York
R. H. Corson	superintendent telegraph	Paterson, N. J.
F. H. Menagh	assistant superintendent telegraph	Paterson, N. J.
J. T. Gallagher	manager station service	New York

TRAFFIC

C. C. Howard	passenger traffic manager	New York
J. F. Shinn	assistant to passenger traffic manager	New York
R. B. Rogers	general passenger agent	New York
H. M. Wade	general baggage, mail and express agent	New York
L. B. Burford	freight traffic manager	New York
J. E. Propper	general freight agent	New York
L. R. Knapp	assistant general freight agent	Pittsburgh, Pa.
O. M. Meyne	assistant general freight agent	New York
E. N. Hambly	chief of tariff bureau	New York
G. H. Reinbrecht	coal traffic manager	New York
George F. Weston	industrial commissioner	New York

ENGINEERING AND SIGNALING

Name	Title	Present Headquarters
G. S. Fanning	chief engineer	New York
A. W. Miesse	assistant to chief engineer	New York
J. W. Smith	principal assistant engineer	New York
F. A. Howard	engineer structures	New York
A. M. Knowles	assistant engineer structures	New York
O. V. Derr	valuation and general office engineer	New York
H. J. Stroebel	assistant valuation engineer	New York
C. H. Splitstone	superintendent of construction	New York
E. T. Johnston	special engineer	New York
H. F. King	special engineer	New York
W. J. Foster	engineer grade crossings	New York
W. R. Marshall	assistant engineer grade crossings	New York
J. C. Patterson	chief engineer, maintenance of way	New York
S. H. Doe	office engineer	New York
W. H. Brameld	office assistant	New York
J. R. MacAsy	general roadmaster and safety supervisor	New York
E. H. Ness	supervisor work, equipment and welding	New York
W. J. Donlevy	supervisor material	New York
R. America	general scale inspector	New York
M. A. Baird	signal engineer	New York
W. S. Storms	assistant signal engineer	New York
W. A. Hough	office engineer	New York

MECHANICAL

C. James	superintendent motive power	New York
F. S. Brown	mechanical engineer	New York
W. A. Cotton	mechanical assistant	New York
J. E. Ingling	supervisor fuel and locomotive operation	New York
C. F. Schultz	supervisor motor cars	New York
J. McMullen	superintendent car department	Hornell, N. Y.
L. S. Kurfess	assistant superintendent car department	Hornell, N. Y.
C. F. McKinney	office engineer	New York
J. L. Ortner	chief shop inspector	Hornell, N. Y.
W. S. James	electrical engineer	New York
H. M. Quinn	supervisor car repairs	Hornell, N. Y.
L. C. Fitzgerald	general A. R. A. inspector	Hornell, N. Y.
N. B. Emley	supervisor tools and machinery	Meadville, Pa.
M. B. Roderick	assistant supervisor tools and machinery	Meadville, Pa.
F. B. Wildrick	material supervisor	New York

PURCHASES AND STORES

F. E. Driscoll	purchasing agent	New York
F. W. Holt	assistant purchasing agent	New York
T. E. Savage	assistant purchasing agent	New York
E. S. Wasson	stationer	New York

An executive office, a passenger and freight traffic organization, and offices of the general manager—operating department, industrial development department, land and tax department and treasury department will continue to be located at 50 Church street, New York.

FINANCIAL, LEGAL AND ACCOUNTING

Marion B. Pierce, who has been appointed general attorney for the Erie, with headquarters, in the near future, at Cleveland, Ohio, was born in Sparta, Ga. He received his higher education at Wofford College, Spartanburg, N. C., and after a varied railway experience in

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BETTER FIRES

FIREBAR CORPORATION
CLEVELAND OHIO.

the operating and traffic departments of the Georgia Railroad and the Southern, he entered the Law School of Columbia University, New York, from which he was graduated in 1909. Later that year he became connected with the law department of the Erie, and has succes-

Marion B. Pierce

sively advanced from law clerk, assistant to the managing clerk, assistant to the general solicitor, assistant general solicitor and assistant general counsel to his present position as general attorney.

Herbert A. Taylor, who has been appointed general counsel of the Erie, with jurisdiction over the legal department of that road and affiliated lines, was born in Beverly, N. J., and is a graduate of Cornell University and the University of Buffalo Law School. He was admitted to the New York State Bar in 1899, and shortly thereafter he became managing clerk in the legal department of the

Herbert A. Taylor

Erie. He held successively the positions of commerce counsel, assistant general solicitor and general attorney, up until the time of Federal control, during which period he served in the office of the director general of railroads. He returned to the service of the Erie as general solicitor on March 15, 1920, and has served in that capacity until his recent promotion to general counsel. Mr. Taylor is one of the officers whose headquarters will be located at Cleveland, Ohio, in the near future.

OPERATING

C. F. Wiegele has been appointed terminal trainmaster of the Cleveland, Cincinnati, Chicago & St. Louis, with headquarters at Columbus, Ohio, and **F. F. McNamee** will succeed Mr. Wiegele as terminal trainmaster at Chicago, Ill.

H. G. Arnold has been appointed trainmaster on the Atchison, Topeka & Santa Fe., with headquarters at Newton, Kan., to succeed **H. S. Nelson,** who has been transferred to Abilene, Kan., where he replaces **W. S. Dickensheets,** who has been assigned to other duties.

J. A. Moran, superintendent of the Eastern division of the St. Louis-San Francisco, with headquarters at Springfield, Mo., has had his jurisdiction extended to include the Springfield terminals, with the same headquarters.

E. W. Deuel, assistant superintendent on the Denver & Rio Grande Western, at Salt Lake City, Utah, has been appointed acting superintendent of the Grand Junction division, with headquarters at Grand Junction, Colo., succeeding **W. R. McPherson,** who has been granted a leave of absence.

Following the abolition of the Akron division of the Pennsylvania and its consolidation with the Cleveland division, **Guy Scott,** superintendent of the former division, with headquarters at Akron, Ohio, has been appointed assistant to the general superintendent of the Lake division, with headquarters at the same point. **J. C. White,** superintendent of the Monongahela division, has moved his headquarters from Uniontown, Pa., to Pittsburgh.

TRAFFIC

M. J. Vandewalker has been appointed division freight agent of the Lehigh Valley, with headquarters at Rochester, N. Y., and **H. R. Stites** will succeed Mr. Vandewalker as general agent at Memphis, Tenn.

George F. Harrigan, perishable freight agent for the Wabash, at Harlingen, Tex., has been appointed general agent in the freight department at Houston, Tex., to succeed **Philip L. Johnson,** who has been appointed assistant freight traffic manager at St. Louis, Mo., as noted in the *Railway Age* for July 25.

ENGINEERING AND SIGNALING

Rudolf P. Forsberg, who has been appointed chief engineer of the Pittsburgh & Lake Erie, with headquarters at Pittsburgh, Pa., effective July 1, was born at Lynchburg, Va., in November, 1870. He entered railroad work in June, 1887, as a rodman on the Lynchburg & Durham (now part of the Norfolk & Western). In 1888, he went, as rodman, to the Richmond & Danville (now part of the Southern), being promoted to levelman and transitman in 1889. During construction of the Yadkin division of that road in 1890 and 1891, he was resident engineer, with office at Salisbury, N. C. He left the employ of the railroad in 1891, to become a draftsman in the office of an architect at Richmond, Va., but returned to railway service the following year as draftsman in the office of the engineer of maintenance of way of the Norfolk & Western, at Roanoke, Va. In September, 1892, he left that company to go with the New York Central Lines as draftsman in the office of the engineer, maintenance of way, of the Pittsburgh & Lake Erie at Pittsburgh, Pa., later being transferred to the office of the chief engineer in the same capacity. In March, 1899, he was appointed chief draftsman at Pittsburgh, and in 1902 was appointed assistant engineer at the same place, being promoted to special engineer in July, 1919. On

Rudolf P. Forsberg

March 1, 1920, he was made principal assistant engineer, with office at Pittsburgh, which position he held until his recent promotion.

MECHANICAL

R. C. Mohler has been appointed mechanical superintendent of the Southern Persian State Railways, with headquarters at Ahwaz, Persia.

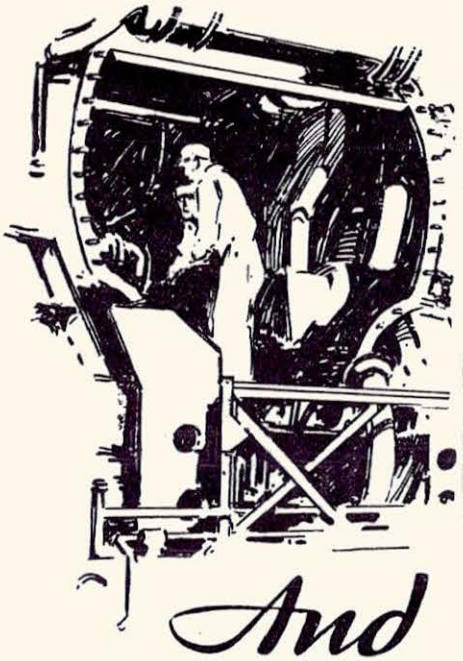
SPECIAL

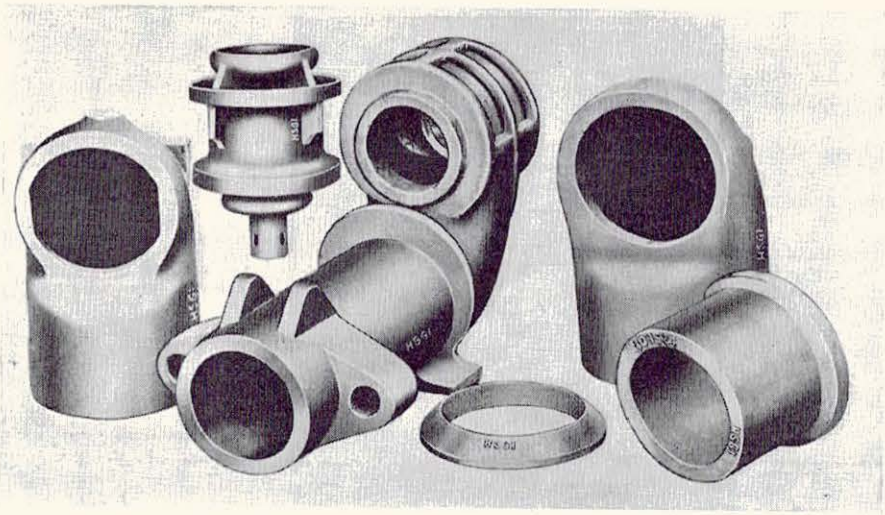
Dr. Charles C. Newcastle has been appointed chief surgeon of the Spokane, Portland & Seattle, with headquarters at Portland, Ore., succeeding **Dr. James C. Zan.**

OBITUARY

Martin J. Caples, formerly vice-president of the Seaboard Air Line, died at Trenton, N. J., on July 29, at the age of 67.

John F. Rossiter, chief special agent of the Chicago, Rock Island & Pacific, with headquarters at Chicago, died on July 24 at Kansas City, Mo., of heart trouble.





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ONE of the most convincing proofs of the qualities built into HUNT-SPILLER *Air Furnace* GUN IRON is its constantly increasing use.

Part after part has been added to its cost reducing scope of application on the locomotive. Today, HUNT-SPILLER *Air Furnace* GUN IRON is being specified for some of the most vital components in the boiler as well as on the engine.

Dry Pipe Sleeves, Elbows, Stand Pipes and Throttle Boxes made of HUNT-SPILLER *Air Furnace* GUN IRON are free from defects which are the cause of dangerous leaks—high temperatures have no effect on them—they serve for many years before renewals are necessary.

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Cylinder Bushings
Cylinder Packing Rings
Pistons or Piston Bull Rings
Valve Bushings
Valve Packing Rings
Valve Bull Rings
Crosshead Shoes
Hub Liners
Shoes and Wedges
Floating Rod Bushings

Parts Finished for Application

Dunbar Sectional Type Packing
Duplex Sectional Type Packing
(Duplex Springs for Above Sectional Packing)
Cylinder Snap Rings
Valve Rings All Shapes

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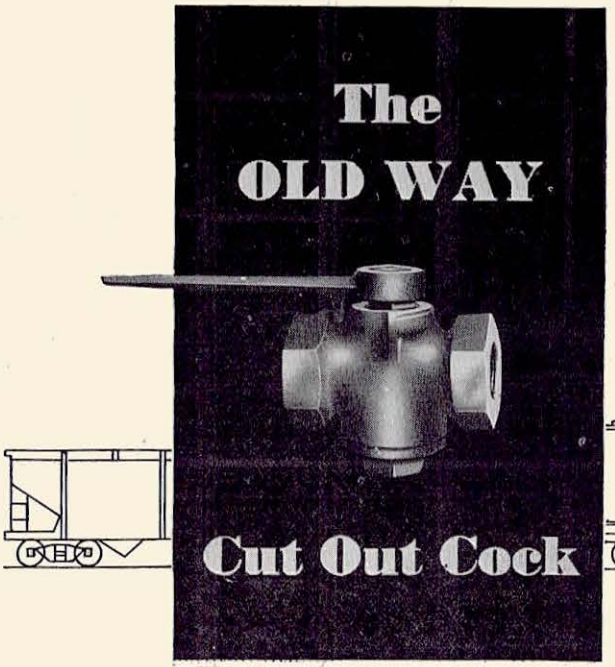
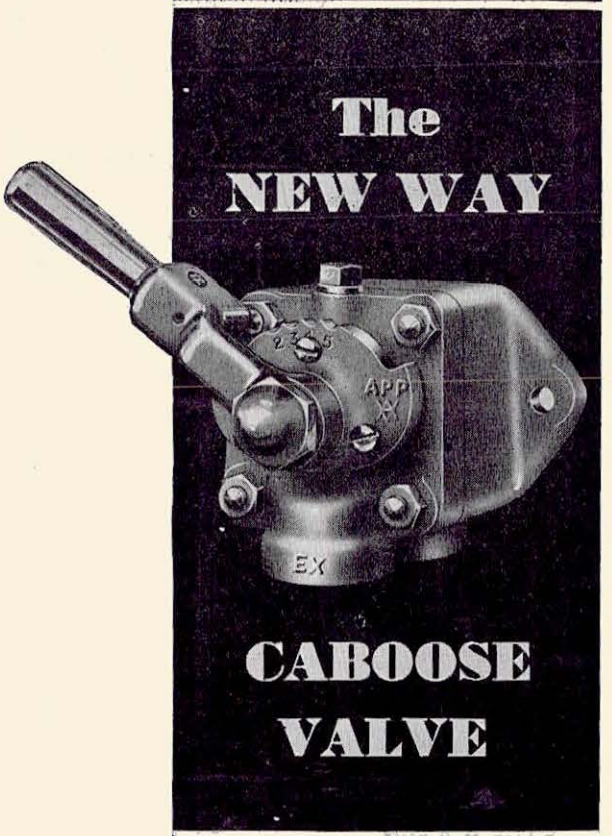
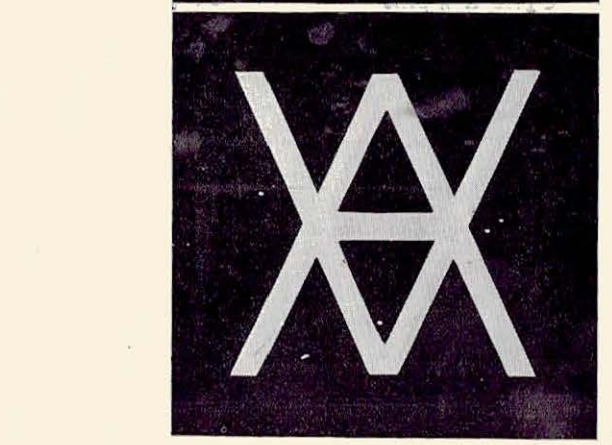
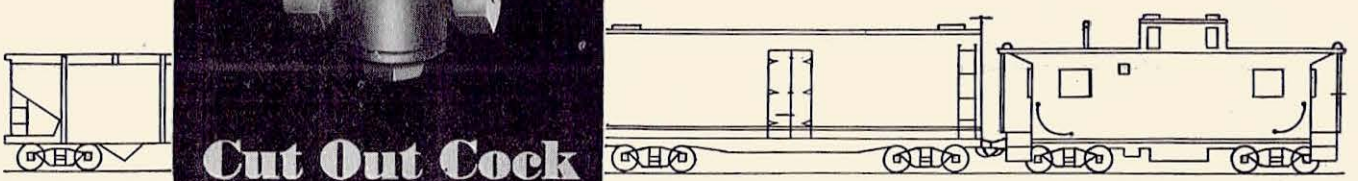
Air Furnace







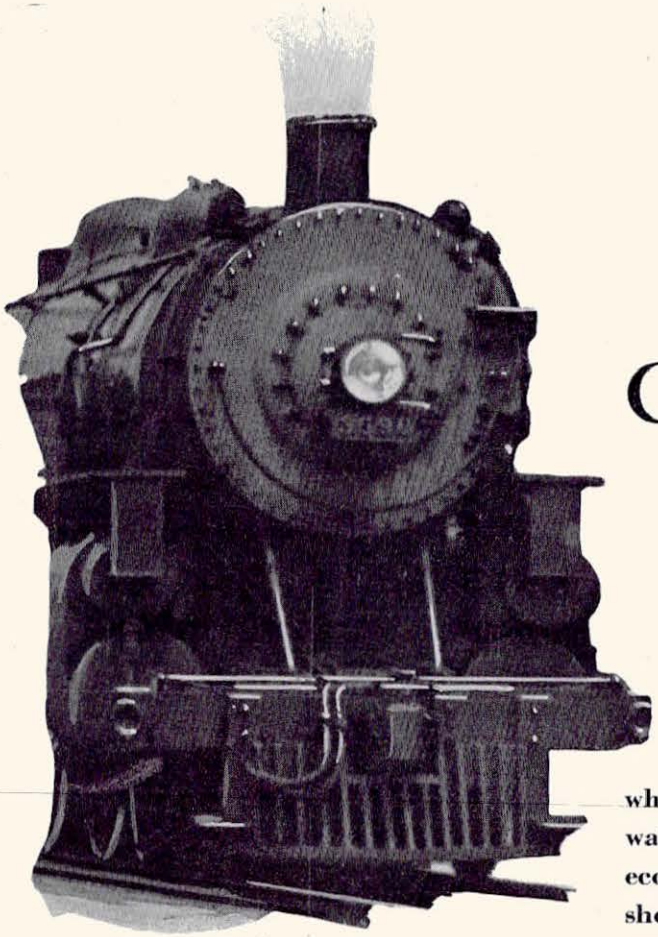


Brake applications from the rear of a freight train—which *should be avoided except in cases of real necessity*—can now be made with greater accuracy and reliability than has heretofore been possible.

The device commonly used for this purpose, an ordinary cut-out cock, lacks flexibility. Even the most cautious effort to open it gradually often results in a heavier application of the brakes than intended. Consequently a new device has been developed expressly for the purpose—The CABOOSE VALVE.

Two types are available: The A-1 which permits the desired rate of reduction, and then allows immediate return of the handle to closed position; the A-2 which permits the desired rate of reduction, but then compels movement of the handle to full application position before closure—a feature designed to prevent unwarranted use of the valve.

Where conditions *require* that applications be made from the rear of the train, the Caboose Valve will be found a valuable device. It is completely described in Circular Notice 1093. WESTINGHOUSE AIR BRAKE CO., General Office and Works—Wilmerding, Pennsylvania



Can You AFFORD to Use Your OLDER POWER..

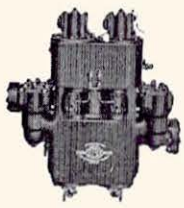
when operating expenses must be so carefully watched? Isn't it through the intensive use of economical power that the railroads are able to show a profit?

Locomotives that have been in service ten years or more, can still be made economical by applying Elesco feed water heaters, which provide increased boiler capacity or substantial fuel savings.

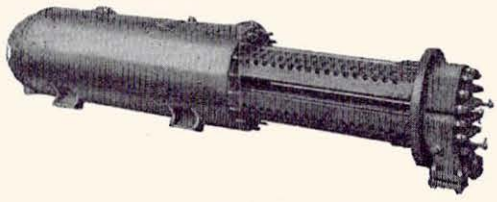
It is then up to the operating department to choose whether they will use the 15 per cent increased boiler capacity provided by the Elesco feed water heater, or, with the original tonnage, reduce the fuel consumption—for the Elesco feed water heater gives fuel savings of 12 to 15 per cent.

Either of these improvements is accomplished solely by the use of exhaust steam that would otherwise be wasted to heat feed water on its way to the boiler.

Apply Elesco feed water heaters to all road locomotives *now*.



CF TYPE
Elesco boiler-feed pump



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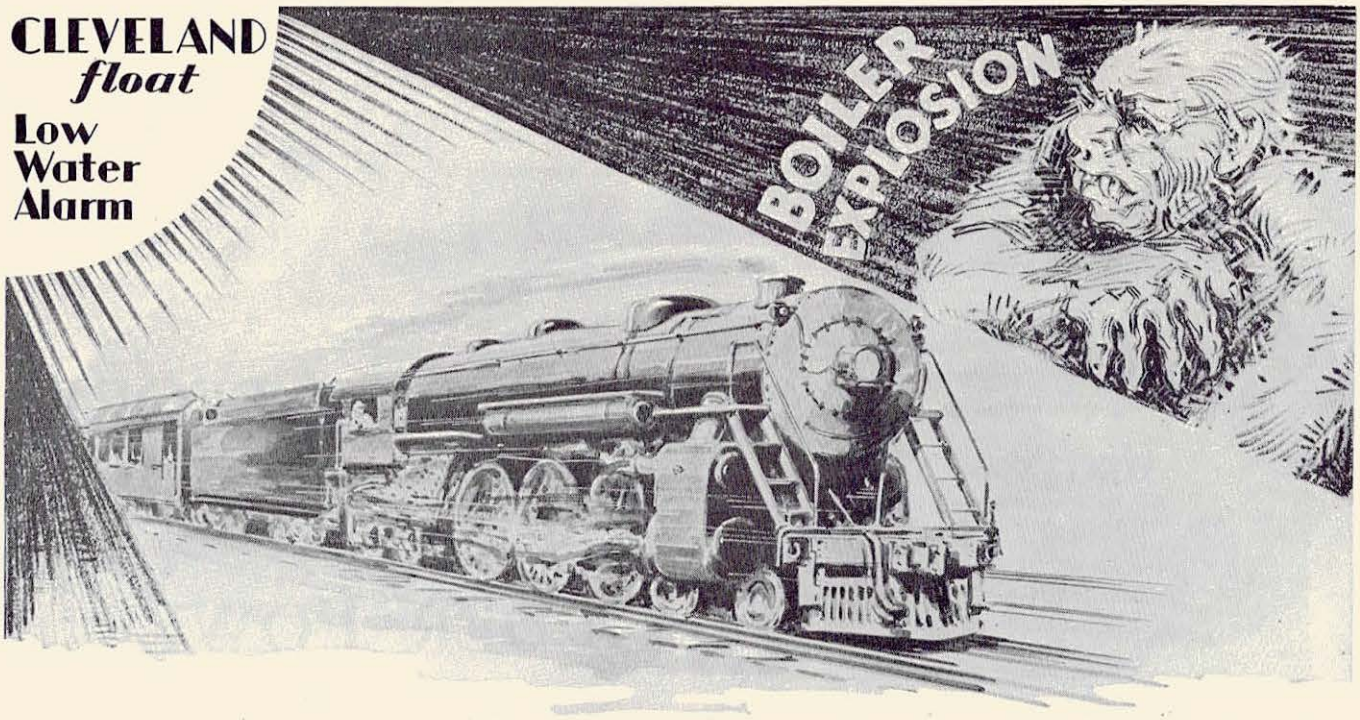
Superheaters
Superheated Steam Pyrometers

A-620

Feed Water Heaters
Exhaust Steam Injectors

CLEVELAND *float* **Low Water Alarm**



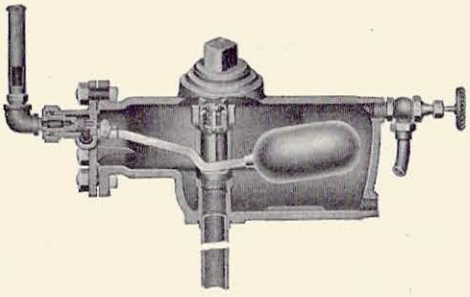
No longer any reason to fear

FROM the time the first locomotive was constructed railroads have been forced to operate under the menacing glare of that terrible spectre "boiler explosions."

Today there is no longer any reason to worry. The haunting fear of a visit from this disastrous monster loses all its terrors when your locomotives are protected with CLEVELAND *Float* LOW WATER ALARMS.

You would not think of operating locomotives without safety valves. Why take chances with the possibilities of plugged water columns and false water levels.

The CLEVELAND *Float* LOW WATER ALARM always functions when low water threatens. It will warn enginemen in plenty of time to prevent one of the worst disasters that can happen on a railroad.



The CLEVELAND *Float* Low Water Alarm can be thoroughly tested, any time or any place, quickly and easily without subsequent adjustments.

You owe this protection to your Stockholders.

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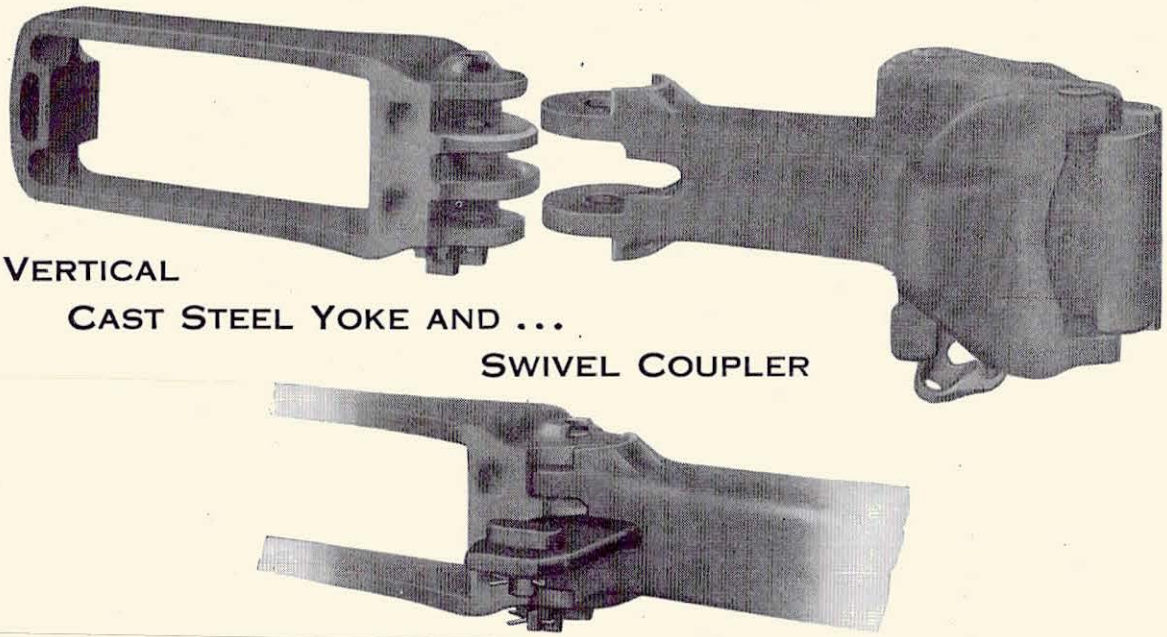
A. R. A. ALTERNATE STANDARD



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CAST STEEL YOKE AND ...
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From the Early Period
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More tonnage hauled per locomotive is but one of the advantages of preventing foaming with "B-A Anti-Foam."

Terminal delays are reduced, train movement is speeded up; fuel and water consumption costs are cut and lubrication is improved.

Bird-Archer water treatment engineers and laboratories are always at your service.

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Always Ready to Fill Rush Orders

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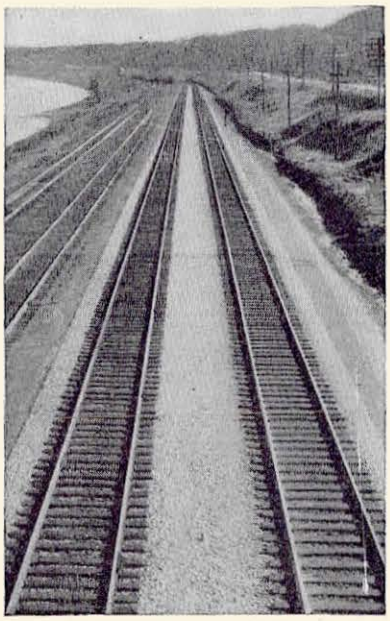

UNUSUAL treating advantages, high and dry storage yards and ample railroad facilities assist us in making prompt shipment of highest grade creosoted cross ties—pine from Georgia and Alabama, red oak from Tennessee. We can supply large or small quantities at a minimum production cost from our two plants, at East Point, Georgia, and Chattanooga, Tennessee. All ties are creosoted by the vacuum-pressure method, assuring deep and uniform penetration, long life and lowest cost per year of service. Let us know your requirements.

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The reputation of your railroad is too dependent upon uninterrupted service to risk the use of any electric wire or cable that is of doubtful serviceability. Specify OKONITE and remove all doubt.

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Mule Hide is fire retardant, impervious to engine gases, waterproofed by complete asphaltic-saturation of every fibre so that it is practically rot-proof, and is a dark brownish-black color to harmonize with its background.

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Lowest Ultimate Cost and Best Appearance

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Passenger Train Cars

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The price you pay for a cleanser is only a part of the total price of cleaning. How far will it go? How much labor is required to use it? These are important questions.

Coro-Noleum, for cleaning and disinfecting at the same time goes further and saves labor. Most of the big railroads of the country use it constantly. Try it on the word and reputation of the largest and most responsible concern of its kind.

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RAILROAD DEPT.
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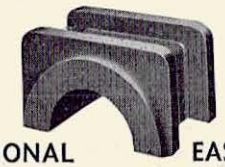
STRONG TOUGH



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AUXILIARY SUPPORTS FOR BRAKE BEAMS
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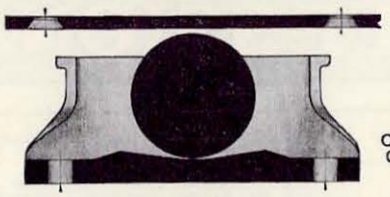

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Solid or Hollow Drilled Staybolts, Lewis Engine Bolt Iron. Also Ryerson Railroad Shop Machinery. Complete stocks of steel for immediate shipment. Write for complete information.
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SEND for Free Special Bulletin and learn how to increase your knowledge of practical railroad work and fit yourself for promotion. The Railway Educational Bureau, Omaha, Neb.

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FOR FIRST COAT AND CONTACT POINTS
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For location of advertisements in this issue of manufacturers listed in the Buyers Index, see Advertisers Index on the last page next to cover

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Remington-Rand Business Service.

Acetylene, Dissolved.
Oxweld Railroad Service Co., The.

Aftercoolers, Air.
Ingersoll-Rand Co.
Worthington Pump & Machinery Corp.

Air Brakes.
New York Air Brake Co.
Westinghouse Air Brake Co.

Aircraft Corrugated Sheet.
Aluminum Co. of America.

Aircraft Extruded & Rolled Shapes.
Aluminum Co. of America.

Aircraft Plates.
Aluminum Co. of America.

Aircraft Screw Machine Products.
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Aircraft Streamline & Round Tubing.
Aluminum Co. of America.

Air Lifts.
Ingersoll-Rand Co.
Worthington Pump & Machinery Corp.

Airport Drainage.
Republic Steel Corp.

Air Pumps.
New York Air Brake Co.
Union Asbestos & Rubber Co.
Westinghouse Air Brake Co.
Worthington Pump & Machinery Corp.

Air Reservoir Joints—(See Joints, Air Reservoir).

Alloy Steel.
Bethlehem Steel Co.
Illinois Steel Co.
Republic Steel Corp.
Ryerson & Son, Inc., Jos. T.

Alloys, Strong Aluminum.
Aluminum Co. of America.

Angle Bars — (See Joints, Rail).

Angles, Channels and Tees—(See Shapes, Structural).

Anti-Creepers, Rail.
Bethlehem Steel Co.
P. & M. Company, The.

Arch, Locomotive Brick.
American Arch Co., Inc.

Arresters, Lightning.
General Electric Co.
General Railway Signal Co.
P. & M. Company.
Railroad Supply Co., The.
Union Switch & Signal Co.
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Ash Conveyors.
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Carnegie Steel Co.
Illinois Steel Co.
Lima Locomotive Works.
Midvale Co., The.
Standard Steel Works Co.

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Brill Co., The J. G.
Mt. Vernon Car Mfg. Co.

Axles, Motor Trucks.
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National Bearing Metals Corp.
Ryerson & Son, Inc., Jos. T.
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Baggage Door Controller Device.
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Batteries, Starting.
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S. K. F. Industries, Inc.
Timken Roller Bearing Co., The.

Bearings, Center.
Brill Co., The J. G.
Chicago Railway Equipment Co.
Miner, W. H.
Pressed Steel Car Co.
Symington Co., The.

Bearings, Journal.
Fafnir Bearing Co.
Magnus Co., Inc.
National Bearing Metals Corp.
S. K. F. Industries, Inc.
Timken Roller Bearing Co., The.

Bearings, Journal Roller.
Fafnir Bearing Co.
S. K. F. Industries, Inc.
Timken Roller Bearing Co., The.

Bearings, Roller.
American Steel Foundries Co.
Fafnir Bearing Co.
Hyatt Roller Bearing Co.
Miner, W. H.
Shafer Bearing Corp.
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Timken Roller Bearing Co.
Wine Railway Appliance Co.

Bearings, Roller Side.
Q. & C. Company, The.
Standard Coupler Co.
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Bearings, Side.
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Stucki Co., A.
Wine Railway Appliance Co.

Beds, Cast Steel, Locomotive.
General Steel Castings Corp.

Bell Ringer, Locomotive.
Ardco Mfg. Co.
Prime Mfg. Co., The.

Bells, Highway Crossing.
Railroad Supply Co.

Belt Lacing Machines.
Birdsboro Steel Foundry & Mach. Co.

Benders, Rail.
Q & C Co., The

Bending and Straightening Machines.
Ryerson & Son, Jos. T.
Sellers & Co., Inc., Wm.

Billets, Steel.
Carnegie Steel Co.
Illinois Steel Co.
Inland Steel Co.
McConway & Torley Co.
Midvale Co., The.
Ryerson & Son, Jos. T.
Republic Steel Corp.
Standard Steel Works Co.

Blocks, Chain.
Barco Mfg. Co.

Blocks, Creosoted.
American Creosoting Co.
Central Coal & Coke Co.
Century Wood Preserving Co.
International Creosoting & Constr. Co.
National Lumber & Creosoting Co.
Southern Wood Preserving Co.

Blooms, Steel.
Carnegie Steel Co.
Republic Steel Corp.

Blower Fittings, Automatic Smokebox.
Barco Mfg. Co.

Blowers, Turbo.
Ingersoll-Rand Co.

Blowtorches, Acetylene.
Oxweld Railroad Service Co., The.

Boiler (all types).
Baldwin Locomotive Works, The.

Boiler Checks.
Prime Manufacturing Co., The.

Boilers, Locomotive.
American Locomotive Co.
Baldwin Locomotive Works
Lima Locomotive Works.

Boilers, Scale Proof.
Industrial Brownhoist Corp.

Bolsters, Steel.
American Steel Foundries.
Bettendorf Co., The.
Birdsboro Steel Foundry & Mach. Co.
Bradford Corporation.
Brill Co., The J. G.
Buckeye Steel Castings Co.
Gould Coupler Co., The.
Mt. Vernon Car Mfg. Co.
Ohio Steel Foundry Co., The
Pressed Steel Car Co.
Symington & Son, Inc., T. H.

Bolts and Nuts.
Baldwin Locomotive Works, The
Bethlehem Steel Co.
Buffalo Brake Beam Co.
Dardelet Threadlock Corp.
Neely Nut & Bolt Co.
Russell, Burdsall & Ward Bolt and Nut Co.
Ryerson & Son, Joseph T.
Westinghouse Elec. & Mfg. Co.

Bolts & Nuts, Monel Metal.
International Nickel Co., The.

Bolts, Patch.
Falls Hollow Staybolt Co.
Ryerson & Son, Joseph T.

Bolts, Track.
Illinois Steel Co.
Inland Steel Co.
Ryerson & Son, Joseph T.

Bonders, Rail.
Q & C Co., The.

Bonding Rail Outfits.
Ingersoll-Rand Co.

Bonds, Rail.
American Steel & Wire Co.
Railroad Supply Co.
Westinghouse Elec. & Mfg. Co.

Bonds, Signal.
American Steel & Wire Co.
Railroad Supply Co.

Bond, Wire Protection.
P & M Co., The.

Boosters, Locomotives.
Franklin Railway Supply Co., Inc.

Boring & Drilling Machines, Horizontal.
Ryerson & Son, Joseph T.
Sellers & Co., Inc., Wm.

Boring Machines, Car Wheel
Sellers & Co., Inc., Wm.

Boring & Turning Mills. Horizontal.
Sellers & Co., Inc., Wm.

Boring & Turning Mills. Vertical.
Sellers & Co., Inc., Wm.

Braces, Rail
Bettendorf Co., The.
Fort Pitt Malleable Iron Co.
National Malleable & Steel Castings Co.
Q & C Co., The.
Ramapo Ajax Co.
Symington Co., The.

Brake Beam Safety Guards.
Buffalo Brake Beam Co.
Chicago Railway Equipment Co.

Brake Beam Supports.
American Steel Foundries.
Brill Co., The J. G.
Buffalo Brake Beam Co.
Chicago Railway Equipment Co.

Brake Beams.
American Steel Foundries.
Bradford Corporation.
Buffalo Brake Beam Co.
Chicago Railway Equipment Co.
Hunt-Spiller Mfg. Corp.
Mt. Vernon Car Mfg. Co.
National Malleable & Steel Castings Co.
Pressed Steel Car. Co.

Brake Drums.
American Car & Foundry Motors Co.
Hunt-Spiller Mfg. Corp.

Brake Forgings, Pins, Levers, etc.
American Steel Foundries.
Brill Co., The J. G.
Buffalo Brake Beam Co.
Davis Brake Beam Co.
Mt. Vernon Car Mfg. Co.
Schaefer Equipment Co.

Brakes, Hand.
National Brake Co.

Brake Heads.
American Steel Foundries.
Brill Co., The J. G.
Buffalo Brake Beam Co.
Chicago Railway Equipment Co.
Pressed Steel Car Co.

Brake Jaws.
Mt. Vernon Car Mfg. Co.
National Malleable & Steel Castings Co.
Schaefer Equipment Co.

Brake Shoes.
American Brake Shoe & Foundry Co.
American Steel Foundries.
Brill Co., The J. G.
Buckeye Steel Castings Co.
Fort Pitt Malleable Iron Co.
Mt. Vernon Car Mfg. Co.
Wheel Truing Brake Shoe Co.

Brake Shoes, Wheel Truing
Wheel Truing Brake Shoe Co.

Brakes, Air.
General Electric Co.
New York Air Brake Co.
Westinghouse Air Brake Co.

Brakes, Clasp.
American Steel Foundries.

Brakes, Electric.
New York Air Brake Co.
Westinghouse Air Brake Co.

Brakes, Hand.
Miner, W. H.
National Brake Co.
National Malleable & Steel Castings Co.
Wine Railway Appliance Co.

Brass, Sash.
Edwards Co., O. M.

Brick, Locomotive Arch.
American Arch Co., Inc.

Bridge Builders.
American Bridge Co.
Bethlehem Steel Co.

Bridge & Brossing Planks, Treated.
Century Wood Preserving Co.
Curtin-Howe Corp.
International Creosoting & Construction Co.
National Lumber & Creosoting Co.

Bridge Flooring.
Carey Co., The, Philip.

Bridge Material, Treated.
Century Wood Preserving Co.
Curtin-Howe Corp.
International Creosoting & Construction Co.
National Lumber & Creosoting Co.

Bridge Stringers — (See Stringers, Bridge).

Bronze Powder, Aluminum.
Aluminum Co. of America.

Bucket Handling.
Industrial Brownhoist Corp.
Milwaukee Electric Crane & Hoist Corp.

Buckets, Grab.
American Bridge Co.
American Hoist & Derrick Co.
Industrial Brownhoist Corp.
Milwaukee Electric Crane & Hoist Corp.
Orton Crane & Shovel Co.

Buffers, Friction.
Edgewater Steel Co.
Miner, W. H.
Standard Coupler Co.
Westinghouse Air Brake Co.

Buffers, Radial.
Franklin Railway Supply Co., Inc.

Building Materials.
Carey & Co., Philip, The.
Johns-Manville Corp.

Buildings, Iron, Steel and Steel Concrete.
American Bridge Co.
United Engineers & Constructors, Inc.

Bulldozers.
Ryerson & Son, Joseph T.

Buses, Motor.
Reo Motor Car Co.

Bushings, Driving & Engine Truck Boxes.
Locomotive Finished Material Co.

Cable Accessories, Electrical.
Graybar Electric Co.

Cables, Electric.
American Steel & Wire Co.
Anaconda Wire & Cable Co.
General Electric Co.
Graybar Electric Co.
Kerite Insulated Wire & Cable Co.
Okonite Co., The.

Cableways—(See Tramways).

Caps, Grease.
Prime Mfg. Co., The.

Carbide, Calcium.
Oxweld Railroad Co., The.
Union Carbide Sales Co.

Car Insulation.
Carey & Co., Philip, The.
Wood Conversion Co.

Car Lighting Equipment—(See Lighting, Car Equipment).

Carlines.
Hutchins Car Rfg. Co.
Mt. Vernon Car Mfg. Co.
Pressed Steel Car Co.

Car Material, Wood.
Central Coal & Coke Co.

Car Parts and Appliances.
Pressed Steel Car Co.
Pullman Car & Mfg. Corp.

Car Parts, Freight.
Bettendorf Co., The.
General American Tank Car Corporation.
Pressed Steel Car Co.

Car Parts, Passenger.
Brill Co., The J. G.
St. Louis Car Co.

Car Repairs.
General American Tank Car Corporation.
Pressed Steel Car Co.
St. Louis Car Co.
Tennessee Coal, Iron & Railroad Co.

Car Retarder Systems.
General Railway Signal Co.
Union Switch & Signal Co.

Car Siding — (See Siding, Car, etc.).

Cars, Baggage.
Brill Co., The J. G.
Pressed Steel Car Co.
St. Louis Car Co.

Cars, Ballast.
Bethlehem Steel Co.
General American Tank Car Co.
Mt. Vernon Car Mfg. Co.
Pressed Steel Car Co.
Western Wheeled Scraper Co.

Cars, Caboose, Coal & Stock.
Mt. Vernon Car Mfg. Co.

Cars, Convertible.
Mt. Vernon Car Mfg. Co.

Cars, Dump.
Bethlehem Steel Co.
Bettendorf Co., The.
Mt. Vernon Car Mfg. Co.
Pressed Steel Car Co.
Western Wheeled Scraper Co.

Cars, Flat, Narrow Gauge.
Bettendorf Co., The.
Pressed Steel Car Co.
Western Wheeled Scraper Co.

Cars, Freight.
Bethlehem Steel Co.
Bettendorf Co., The.
General American Tank Car Corp.
Mt. Vernon Car Mfg. Co.
Pressed Steel Car Co.
Pullman Car & Mfg. Co.

Cars, Freight (New and Repaired).
Bethlehem Steel Co.
Bettendorf Co., The.
General American Tank Car Corp.
Pressed Steel Car Co.

Cars, Gasoline-Electric.
Brill Co., The J. G.
Electro-Motive Co.
St. Louis Car Co.

Cars, Gasoline Motor.
Brill Co., The J. G.

Cars, Hand & Push.
Fairbanks-Morse & Co.

Cars, Industrial.
Bethlehem Steel Co.
Brill Co., The J. G.
General American Tank Car Corp.
Pressed Steel Car Co.
Western Wheeled Scraper Co.

Cars, Motor.
Fairbanks-Morse & Co.

Cars, Motor Inspection.
Fairbanks-Morse & Co.

Cars, Oil Electric.
Westinghouse Elec. & Mfg. Co.

Cars, Ore.
Brill Co., The J. G.
General American Tank Car Corp.
Pressed Steel Car Co.

Cars, Passenger.
Bethlehem Steel Co.
Brill Co., The J. G.
Electro-Motive Co.
Pressed Steel Car Co.
Pullman Car & Mfg. Corp.

Cars, Power Units.
Brill Co., The J. G.
Electro-Motive Co.

Cars, Quarry.
Pressed Steel Car Co.
Western Wheeled Scraper Co.

Cars, Rebuilt and Repaired.
Bettendorf Co., The.
General American Tank Car Corp.
Mt. Vernon Car Mfg. Co.
Pressed Steel Car Co.
Western Wheeled Scraper Co.

Cars, Refrigerator.
General American Tank Car Co.
Mt. Vernon Car Mfg. Co.
Pressed Steel Car Co.

Cars, Second-Hand.
Pressed Steel Car Co.
Western Wheeled Scraper Co.

Cars, Self-Propelled Passenger.
Brill Co., The J. G.
Electro-Motive Co.
General Electric Co.
Pullman Car & Mfg. Corp.
Westinghouse Elec. & Mfg. Co.

Cars, Spreader.
Western Wheeled Scraper Co.

Cars, Tank.
Bethlehem Steel Co.
General American Tank Car Corp.
Indian Refining Co.
Pressed Steel Car Co.

Cars, Dump.
Western Wheeled Scraper Co.

Castings, Alloy Steel.
Symington Co., The.
Union Spring & Mfg. Co.

Castings, Brass and Bronze.
Baldwin Locomotive Works, The.
General Railway Signal Co.
Magnus Co., Inc.
National Bearing Metals Corp.
Union Switch & Signal Co.

Castings, Gray Iron.
American Brake Shoe & Foundry Co.
American Locomotive Co.
Baldwin Locomotive Works.
General Railway Signal Co.
Locomotive Finished Material Co.
Mt. Vernon Car Mfg. Co.
Ramapo Ajax Corp.
Union Switch & Signal Co.

Castings, Gun Iron.
Hunt-Spiller Mfg. Corp.

Castings, Iron & Steel.
Baldwin Locomotive Works, The.
Industrial Brownhoist Corp.

Castings, Malleable Iron.
Buckeye Steel Castings Co.
Buffalo Brake Beam Co.
Chicago Railway Equipment Co.
Fort Pitt Malleable Iron Co.
National Malleable & Steel Castings Co.
P & M Company, The.
Pressed Steel Car Co.
Symington Co., The.
Universal Draft Gear Attachment Co.

Castings, Monel Metal.
International Nickel Co., The.

Castings, Steel.
Allegheny Steel Co.
American Locomotive Co.
American Steel Foundries.
Bethlehem Steel Co.
Bettendorf Co., The.
Birdsboro Steel Foundry & Mach. Co.
Buckeye Steel Castings Co.
General Steel Castings Corp.
Gould Coupler Co., The.
McConway & Torley Co.
Midvale Co., The.
National Malleable & Steel Castings Co.
Pressed Steel Car Co.
Standard Steel Works Co.
Union Spring & Mfg. Co.
Union Steel Casting Co.
Universal Draft Gear Attachment Co.

Castings, Steel Loco.
Birdsboro Steel Foundry & Machine Co.
General Steel Castings Corp.
Gould Coupler Co., The.
Ohio Steel Foundry Co., The.
Standard Steel Works Co.
Union Steel Casting Co.

Castings, Steel Vanadium.
Birdsboro Steel Foundry & Machine Co.
Brill Co., The J. G.
Ohio Steel Foundry Co., The.
Standard Steel Works Co.
Union Steel Casting Co.

Catchbasins, Iron.
Armco Culvert Mfrs. Assoc.

Cellers, Engine Truck.
Ardco Mfg. Co.

Cement Car, Asphalt.
Lehon Co., The.
Sherwin-Williams Co.

Cement, High Temperature.
Carey Co., Philip, The.
Johns-Manville Corp.

Cements, Asbestos and Magnesia.
Carey Co., Philip, The.

Center Plates—(See Bearings, Center).

Center Sills.
Bettendorf Co., The.
Bradford Corporation.

Chain, Monel Metal.
International Nickel Co., The.

Chemicals.
Bird-Archer Co., The.
Dearborn Chemical Co.
Hunt Co., Robert W.

Chemicals, Boiler.
Bird-Archer Co., The.
Dearborn Chemical Co.

Chemicals, Cleaning.
Oakite Products, Inc.

Chemists.
Bird-Archer Co., The.
Dearborn Chemical Co.
Hunt Co., Robert W.
Pittsburgh Testing Laboratory.

Chromium Plating.
Worthington Pump & Machinery Corp.

Chucks, Lathe.
Ryerson & Son, Jos. T.

Cinder Handling Plants.
Roberts & Schaefer Co.

Circuit Breakers.
General Electric Co.
Union Switch & Signal Co.
Westinghouse Elec. & Mfg. Co.

Clamps, Forging.
Ryerson & Son, Jos. T.

Clamps, Guard Rail.
Q. & C. Co., The.
Westinghouse Air Brake Co.

Clamps, Hose.
Ingersoll-Rand Co.
National Malleable & Steel Castings Co.
Vapor Car Heating & Lighting Co.
Westinghouse Air Brake Co.

Clamps, Pipe.
Franklin Railway Supply Co., Inc.
National Malleable & Steel Castings Co.

Clamps, Rail Cutting.
Oxweld Railroad Service Co., The.

Classification Yard Systems.
General Railway Signal Co.
Union Switch & Signal Co.

Cleaners, Aircraft.
Oakite Products, Inc.

Cleaners, Air Pump.
Oakite Products, Inc.
Westinghouse Air Brake Co.

Cleaners, Bus & Truck.
Oakite Products, Inc.

Cleaners, Car.
Oakite Products, Inc.

Cleaners, Flue.
Ryerson & Son, Jos. T.

Cleaners, General.
Oakite Products, Inc.

Cleaners, Locomotive.
Oakite Products, Inc.

Cleaners, Metal.
Oakite Products, Inc.

Clips, Wire Rope.
American Steel & Wire Co.

Coach and Coach Yard Steam Joints—(See Joints, etc.)

Coaches, Motor.
American Car & Foundry Motors Co.
Dodge Motor Truck Corp.
International Harvester Co.
White Co., The.

Coaches, SecondHand.
Hyman-Michaels Co.

Coal, Ore & Ash Handling Machinery.
Industrial Brownhoist Corp.
Milwaukee Electric Crane & Hoist Corp.
Orton Crane & Shovel Co.
Roberts & Schaefer Co.

Coal Pushers.
Standard Stoker Co.

Coaling Stations.
American Bridge Co.
FairbanksMorse & Co.
Roberts & Schaefer Co.

Cocks, Angle.
Westinghouse Air Brake Co.

Cocks, Blow-Off.
Bird-Archer Co., The.

Cocks, Cylinder.
Prime Manufacturing Co., The.

Columns, Water.
Prime Manufacturing Co., The.

Combination Crane Pile Drivers.
Industrial Brownhoist Corp.

Compounds, Boiler.
Dearborn Chemical Co.
Bird-Archer Co., The.

Compounds, Cleaning.
Oakite Products, Inc.

Compounds, Cutting.
Oakite Products, Inc.

Compounds, Grinding.
Oakite Products, Inc.

Compounds, Paint Removing.
Oakite Products, Inc.

Compounds, Rust Proofing.
Oakite Products, Inc.

Compressors, Air.
Ingersoll-Rand Co.
New York Air Brake Co.
Westinghouse Air Brake Co.
Worthington Pump & Machinery Corp.

Concrete Floor Slabs.
Federal American Cement Tile Co.

Concrete Reinforcement.
American Steel & Wire Co.
Carnegie Steel Co.
Ryerson & Son, Jos. T.

Concrete Roofing, Tile.
Federal American Cement Tile Co.

Condensers.
Ingersoll-Rand Co.

Condensing Apparatus.
Ingersoll-Rand Co.
Worthington Pump & Machinery Corp.

Conduit, Rigid.
Aluminum Co. of America.

Conduits, Metallic Flexible.
Barco Mfg. Co.
Franklin Railway Supply Co., Inc.
Graybar Electric Co.
Vapor Car Heating Co., Inc.

Conduit, Underground.
Graybar Electric Co.
Johns-Manville Corp.

Connections, Lever.
National Malleable & Steel Castings Co.

Connections, Truck.
National Malleable & Steel Castings Co.

Connections, Truck Lever.
Schaefer Equipment Co.

Contraction Joint.
General Railway Signal Co.

Control Devices, Train Speed.
Union Switch & Signal Co.

Control, Locomotive.
Valve Pilot Co.

Controllers, Electric.
General Electric Co.
Westinghouse Electric & Mfg. Co.

Conveying Machinery.
American Bridge Co.
Industrial Brownhoist Corp.
Milwaukee Electric Crane & Hoist Corp.
Orton Crane & Shovel Co.

Corrugated Sheet.
Aluminum Co. of America.

Conveyor, Ash—(See Coal, Ore and Ash Handling Mach.).

Coupler Pockets—(See Draft Yokes).

Coupler Yokes.
Bettendorf Co., The.
Gould Coupler Co.
Symington Co., The.

Couplers.
American Steel Foundries.
Buckeye Steel Castings Co.
Franklin Railway Supply Co., Inc.
Gould Coupler Co., The.
McConway & Torley Co.
National Malleable & Steel Castings Co.
Standard Coupler Co.
Westinghouse Air Brake Co.

Couplings, Hose.
Fort Pitt Malleable Iron Co.
Gold Car Heating & Lighting Co.
Ingersoll-Rand Co.
Vapor Car Heating Co., Inc.
Westinghouse Air Brake Co.

Cranes, Ballast Cleaning.
American Hoist & Derrick Co.
Industrial Brownhoist Corp.
Ohio Locomotive Crane Co.

Cranes, Barge.
Industrial Brownhoist Corp.
Ohio Locomotive Crane Co.

Cranes, Bracket.
Shephard-Niles Crane & Hoist Corp.

Cranes, Crawler.
American Hoist & Derrick Co.
Industrial Brownhoist Corp.
Orton Crane & Shovel Co.

Cranes, Crawling Shovels and Draglines.
Industrial Brownhoist Corp.
Orton Crane & Shovel Co.

Cranes, Diesel.
Industrial Brownhoist Corp.
Ohio Locomotive Crane Co.

Cranes, Electric Traveling.
Industrial Brownhoist Corp.
Milwaukee Electric Crane & Hoist Corp.

Cranes, Gantry.
Industrial Brownhoist Corp.
Milwaukee Electric Crane & Hoist Corp.
Ohio Locomotive Crane Co.
Orton Crane & Shovel Co.
Shephard-Niles Crane & Hoist Corp.

Cranes, Gasoline.
Industrial Brownhoist Corp.
Ohio Locomotive Crane Co.

Cranes, Grab Bucket.
Milwaukee Electric Crane & Hoist Corp.

Cranes, Handpower.
Industrial Brownhoist Corp.
Shephard-Niles Crane & Hoist Corp.

Cranes, Jib.
Industrial Brownhoist Corp.
Milwaukee Electric Crane & Hoist Corp.
Worthington Pump & Machinery Corp.

Cranes, Locomotive.
Industrial Brownhoist Corp.
Ohio Locomotive Crane Co.
Orton Crane & Shovel Co.

Cranes, Overhead.
Industrial Brownhoist Corp.
Milwaukee Electric Crane & Hoist Corp.
Shephard-Niles Crane & Hoist Corp.

Cranes, Pillar.
Industrial Brownhoist Corp.
Milwaukee Electric Crane & Hoist Corp.

Cranes, Portable.
Orton Crane & Shovel Co.

Cranes, Transfer.
Industrial Brownhoist Corp.
Milwaukee Electric Crane & Hoist Corp.

Cranes, Traveling.
Milwaukee Electric Crane & Hoist Corp.
Shephard-Niles Crane & Hoist Corp.

Cranes, Wharf.
Industrial Brownhoist Corp.
Ohio Locomotive Crane Co.

Cranes, Wrecking.
Industrial Brownhoist Corp.
Orton Crane & Shovel Co.

Crank Pins — (See Pins, Crank).

Creosote.
American Creosoting Co.
Century Wood Preserving Co.
International Creosoting & Constr. Co.
National Lumber & Creosoting Co.

Creosote, Wood Preservative Treatment.
Century Wood Preserving Co.
National Lumber & Creosoting Co.

Cribbing Units.
Federal American Cement Tile Co.

Cross Arms, Treated.
American Creosoting Co.
Century Wood Preserving Co.
Curtin-Howe Corp.
Graybar Electric Co.
International Creosoting & Construction Co.
National Lumber & Creosoting Co.
Southern Wood Preserving Co.

Cross Ties, Treated.
American Creosoting Co.
Century Wood Preserving Co.
Curtin-Howe Corp.
International Creosoting & Construction Co.
National Lumber & Creosoting Co.
Southern Wood Preserving Co.

Cross Ties, Steel.
Bethlehem Steel Co.

Crossheads & Shoes.
Baldwin Locomotive Wks.
Barco Mfg. Co.
International Creosoting & Construction Co.

Crossing Signals & Signs.
Railroad Supply Co.

Crossings—(See Frogs and Crossings).

Crossings, Pavement.
Carey Co., The Philip.

Crushers, Coal.
American Sheet & Tin Plate Co.
Orton Crane & Shovel Co.

Culverts.
Armco Culvert Mfrs. Assoc.
Republic Steel Corp.
Toncan Culvert Manufacturers' Association.

Culverts, Corrugated Iron
Armco Culvert Manufacturers' Association.
Republic Steel Corp.

Culverts, Part Circle
Armco Culvert Manufacturers Association

Culverts, Treated.
Century Wood Preserving Co.
National Lumber & Creosoting Co.
Southern Wood Preserving Co.

Cups, Oil.
Hammett, H. G.
New York Air Brake Co.
Prime Manufacturing Co., The.
Westinghouse Air Brake Co.

Curtains & Fixtures, Car Window.
Pantasote Co., Inc., The.

Curtain Material, Car.
Ryerson & Son, Jos. T.

Curtains, Cab.
Lehon Co., The.

Cutting and Welding Apparatus.
Oxweld Railroad Service Co.
Westinghouse Electric & Mfg. Co.

Cut-Off Indicators and Recorders.

Cylinder Parts, Finished and Rough.
Locomotive Finished Material Co.
National Tube Co.
Valve Pilot Co.

Cylinders, Air Brake.
Westinghouse Air Brake Co.

Cylinders, Cast Steel Locomotive.
General Steel Castings Corp.
Union Steel Casting Co.

Cylinders, Locomotive.
Locomotive Finished Material Co.

Cylinders, Oxy-Acetylene.
Oxweld Railroad Co., The.

Deoxidizers.
Q & C Co., The.
Vanadium Corp. of America.

Derricks.
Industrial Brownhoist Corp.

Diesel Electric Power Plants.
Fairbanks-Morse & Co.
Westinghouse Elec. & Mfg. Co.

Dirt Collectors.
New York Air Brake Co.
Westinghouse Air Brake Co.

Disinfectants.
West Disinfecting Co.

Dispatching Systems.
General Railway Signal Co.
Union Switch & Signal Co.

Ditching Machinery.
Industrial Brownhoist Corp.
Orton Crane & Shovel Co.

Door Fixtures — (See Fixtures, Car Door).

Doors, Car.
Camel Sales Co.
Chicago Railway Equipment Co.
Miner, W. H.
Wine Railway Appliance Co.

Doors, Locomotive Firebox.
Franklin Railway Supply Co., Inc.

Doors, Rolling, Steel.
Kinnear Mfg. Co.

Draft Arms.
American Steel Foundries.
Birdsboro Steel Foundry & Machine Co.
Bradford Corporation.
Symington Co., The.
Universal Draft Gear Attachment Co.

Draft Gear Attachments.
Symington Co., The

Draft Gears.
American Steel Foundries.
Bradford Corporation.
Cardwell-Westinghouse Co.
Edgewater Steel Co.
Fort Pitt Malleable Iron Co.
Miner, W. H.
National Malleable & Steel Castings Co.
Standard Coupler Co.
Union Draft Gear Co.
Universal Draft Gear Attachment Co.

Draft Yokes.
American Steel Foundries.
Bettendorf Co., The.
Buckeye Steel Castings Co.
Gould Coupler Co., The.
McConway & Torley Co.
Miner, W. H.
Mt. Vernon Car Mfg. Co.
National Malleable & Steel Castings Co.
Pressed Steel Car Co.
Steel Car Forge Co.
Symington Co., The.
Universal Draft Gear Attachment Co.

Drainage Gates, Automatic
Armco Culvert Mfrs. Assoc.
Republic Steel Corp.

Drains, Perforated Iron.
Republic Steel Corp.

Drawbar Centering Device.
Gould Coupler Co., The.
Miner, W. H.

Drawbars, Unit Safety.
Franklin Railway Supply Co., Inc.
Industrial Brownhoist Corp.

Dredging Machinery.
Industrial Brownhoist Corp.

Drilling Machines.
Sellers & Co., Inc., Wm.

Drilling Machines, Bonding.
Railroad Supply Co.

Drilling Machines, Pneumatic
Ingersoll-Rand Co.

Drilling Machines, Rock.
General Electric Co.
Ingersoll-Rand Co.
Worthington Pump & Machinery Corp.

Drilling Machines, Upright and Radial.
Ryerson & Son, Joseph T.
Sellers & Co., Inc., Wm.

Drills.
Ingersoll-Rand Co.

Drills, Close Corner.
Ingersoll-Rand Co.

Drills, Concrete.
Ingersoll-Rand Co.
Worthington Pump & Machinery Corp.

Drills, Steel Rock and Steel Sharpened.
Ingersoll-Rand Co.
Worthington Pump & Machinery Corp.

Drills, Track & Bending.
Bird-Archer Co., The.
Ingersoll-Rand Co.

Drive Gas Electric Coaches.
General Electric Co.

Drive Gas Electric Locomotives
Westinghouse Electric & Mfg. Co.

Driving Boxes (Extended Main).
Franklin Railway Supply Co., Inc.

Drop Door Mechanism.
Wine Railway Appliance Co.

Dynamos—(See Generators, Electric).

Electrical Cable Accessories.
General Electric Supply Corp.

Electric Cables.
American Steel & Wire Co.
Anaconda Wire & Cable Co.
General Electric Supply Corp.

Electrical Instruments.
Electric Service Supplies Co.
Railroad Supply Co.
Westinghouse Elec. & Mfg. Co.

Electrical Supplies.
General Electric Co.
General Electric Supply Corp.
Graybar Electric Co.
Westinghouse Elec. & Mfg. Co.

Electrification, Railroad.
Battey & Kipp.
General Electric Co.
United Engineers & Constructors, Inc.
Westinghouse Elec. & Mfg. Co.

Electric Heaters.
General Electric Supply Corp.

Electrical Insulation.
General Cable Corp.
General Electric Supply Corp.

Electrical Porcelain Insulators.
General Electric Supply Corp.

Electric Motors.
General Electric Supply Corp.

Electric Rivet Heaters.
General Electric Supply Corp.

Electric Switches.
General Electric Supply Corp.

Enamels.
Lowe Bros. Co., The.
Sherwin-Williams Co.

End Frames, Cast Steel, Passenger Car.
General Steel Castings Corp.

Ends, Steel.
Hutchins Car Rfg. Co.
Union Metal Products Co.

Engineers, Consulting, Civil, Elec., Hydraulic. Mechanical.
Battey & Kipp.
Hunt Co., Robt. W.
Muhlfeld, John E.
United Engineers & Constructors, Inc.

Engineers, Contracting.
Battey & Kipp.
United Engineers & Constructors, Inc.

Engineers and Contractors.
Battey & Kipp.
Hunt Co., Robert W.
Muhlfeld, John E.
United Engineers & Constructors, Inc.

Engineers, Construction.
Battey & Kipp.
Roberts & Schaefer Co.
United Engineers & Constructors, Inc.

Engineers and Contractors, Elec., Hydraulic, Mech.
Battey & Kipp.
Hunt Co., Robert W.
Muhlfeld, John E.
Roberts & Schaefer Co.

Engineers, Inspecting.
Gulick-Henderson Co.
Hunt Co., Robert W.
Muhlfeld, John E.
Pittsburgh Testing Laboratory.
United Engineers & Constructors, Inc.

Engineers, Valuation.
Hunt Co., Robert W.
United Engineers & Constructors, Inc.

Engines, Crude & Fuel Oil.
Fairbanks-Morse & Co.
Ingersoll-Rand Co.
Worthington Pump & Machinery Corp.

Engines, Diesel.
Worthington Pump & Machinery Corp.

Engines, Gas.
Brill Co., The J. G.
Worthington Pump & Machinery Corp.

Engines, Gas & Gasoline.
American Car & Foundry Motors Co.
Fairbanks-Morse & Co.
Ingersoll-Rand Co.
Worthington Pump & Machinery Corp.

Engines, Hoisting.
Industrial Brownhoist Corp.
Orton Crane & Shovel Co.

Excavators.
Industrial Brownhoist Corp.

Exhaust & Heater Pipe.
Union Asbestos & Rubber Co.

Exhaust & Ventilating Fans.
General Electric Supply Corp.

Expanders, Tube.
Ryerson & Son, Joseph T.

Fans, Exhaust & Ventilating.
General Electric Co.
Graybar Electric Co.
Westinghouse Elec. & Mfg. Co.

Fasteners, Car Door.
Camel Sales Co.
Fort Pitt Malleable Iron Co.
Miner, W. H.
National Malleable & Steel Castings Co.

Feed Water Heater Systems.
Bird-Archer Co., The.
Coffin, Jr., Co., The J. S.
Worthington Pump & Machinery Corp.

Fencing Wire—(See Wire, Fence).

Fence Posts, Treated.
American Steel & Wire Co.
Century Wood Preserving Co.
Curtin-Howe Corp.
International Creosoting & Construction Co.
National Lumber & Creosoting Co.

Ferro Alloys.
Vanadium Corp. of America.

Ferro, Chromium.
Vanadium Corp. of America.

Ferro, Molybdenum.
Electro Metallurgical Sales Corp.
Vanadium Corp. of America.

Ferro, Silicon.
Vanadium Corp. of America.

Ferro, Tungsten.
Vanadium Corp. of America.

Ferro, Vanadium.
Vanadium Corp. of America.

Filters, Air.
New York Air Brake Co.
Westinghouse Air Brake Co.

Filters, Water & Industrial.
Graver Tank & Mfg. Corp.

Filtration Plants (Water).
Graver Tank & Mfg. Corp.

Fireboxes.
American Locomotive Co.
Baldwin Locomotive Works.

Fire Fighting & Protection Equipment.
Johns-Manville Corp.

Fittings, Air Brakes.
Westinghouse Air Brake Co.

Fittings, Steam.
Vapor Car Heating Co., Inc.

Fixtures, Car Door.
Camel Sales Co.
Chicago Railway Equipment Co.
Miner, W. H.
National Malleable & Steel Castings Co.

Flangers, Snow.
Q & C Co., The.

Floodlights.
General Electric Supply Corp.
Graybar Electric Co.
Oxweld Railroad Service Co.
Pyle-National Co.
Symington Co., The.
Westinghouse Elec. & Mfg Co.

Floodlights, Acetylene.
Oxweld Railroad Service Co., The.

Flooring.
Carey & Co., Philip, The.
Johns-Manville Corp.

Flooring, Car.
Tuco Products Corp.

Flooring, Coach.
Tuco Products Corp.

Flooring, Composition.
Johns-Manville Corp.
Tuco Products Corp.

Flooring, Treated.
Central Coal & Coke Co.
Century Wood Preserving Co.
Curtin-Howe Corp.
National Lumber & Creosoting Co.

Floor Plates, Steel.
Carnegie Steel Co.
Illinois Steel Co.
Inland Steel Company

Floor Slabs, Concrete.
American Cement Tile Mfg. Co.

Flue Cleaners—(See Cleaners, Flue).

Flue Cutters—(See Cutters, Flue).

Flues, Boiler—(See Tubes, Boiler).

Flue Shop Equipment.
Ryerson & Son, Joseph T.

Forges, Rivet Heating.
Ryerson & Son, Joseph T.

Forging Hammers.
Industrial Brownhoist Corp.

Forgings.
American Bridge Co.
American Steel Foundries
Baldwin Locomotive Works
The.
Bethlehem Steel Co.

Brill Co., The J. G.
Carnegie Steel Co.
Edgewater Steel Co.
General Railway Signal Co.
Gould Coupler Co., The.
Illinois Steel Co.
Midvale Co., The.
Mt. Vernon Car Mfg. Co.
Neely Nut & Bolt Co.
Pressed Steel Car Co.
Standard Steel Works Co.
Steel Car Forge Co.
Universal Draft Gear Attachment Co.

Forgings, Drop.
Baldwin Locomotive Works, The.
Brill Co., The J. G.
General Railway Signal Co.
Steel Car Forge Co.
Union Switch & Signal Co.

Forgings, Monel Metal.
International Nickel Co., The.

Foundry Supplies.
Bird-Archer Co., The.

Frames, Cast Steel Locomotive
General Steel Castings Corp.

Frames, Locomotive.
American Steel Foundries.
American Locomotive Co.
Baldwin Locomotive Works.
Birdsboro Steel Foundry & Machine Co.
Ohio Steel Foundry Co., The.
Union Steel Casting Co.

Frames, Truck.
American Locomotive Co.
American Steel Foundries.
Baldwin Locomotive Works
Bettendorf Co., The.
Birdsboro Steel Foundry & Machine Co.
Buckeye Steel Castings Co.
Brill Co., The J. G.
Franklin Railway Supply Co., Inc.
Gould Coupler Co., The.
Ohio Steel Foundry Co., The.
Pressed Steel Car Co.
Pyle-National Co.
Symington Co., The.

Frames, Vanadium.
American Locomotive Co.
Baldwin Locomotive Works
Birdsboro Steel Foundry & Machine Co.
Union Steel Casting Co.

Frogs and Crossings.
Bethlehem Steel Co.
Ramapo Ajax Corp.

Fulcrums, Brake Beam.
American Steel Foundries.
Brill Co., The J. G.
Buffalo Brake Beam Co.
Chicago Railway Equipment Co.
National Malleable & Steel Castings Co.

Furnaces, Electric.
General Electric Co.
Westinghouse Elec. & Mfg. Co.

Furnaces, Gasoline.
Railroad Supply Co.

Furnaces, Rivet Heating—(See Forges, Rivet Heating).

Furniture.
Aluminum Co. of America.

Gage Testers—(See Testers, Gage).

Gages, Air.
Westinghouse Air Brake Co.

Gages, Oxy-Acetylene.
Oxweld Railroad Service Co., The.

Gages, Steam.
Ashton Valve Co.

Gages, Tire.
Schrader's Son, Inc., A.

Gages, Wheel Press Recording.
Ashton Valve Co.

Gaskets.
Westinghouse Air Brake Co.

Gasoline.
Ethyl Gasoline Corp.

Gear Blanks, Rolled Steel.
Edgewater Steel Co.
Standard Steel Works Co.

Gears and Pinions.
American Steel Foundries.
Westinghouse Elec. & Mfg. Co.

Gears, Silent.
General Electric Co.
Westinghouse Elec. & Mfg. Co.

Gears, Valve — (See Valve Gears).

Generators, Acetylene.
Oxweld Railroad Service Co.

Generators, Car Lighting.
Safety Car Heating & Lighting Co.

Generators, Electric.
Fairbanks-Morse & Co.
General Electric Co.
Graybar Electric Co.
Sunbeam Electric Mfg. Co.
Westinghouse Elec. & Mfg. Co.

Goggles, Welding.
Oxweld Railroad Service Co., The.
Sunbeam Electric Mfg. Co.

Graders, Elevating.
Western Wheeled Scraper Co.

Grapples, Wood.
Industrial Brownhoist Corp.

Grate Bars.
Q & C Co., The.

Grate Shakers, Automatic.
Franklin Railway Supply Co., Inc.

Grates.
Firebar Corp.

Grease Forming Machines.
Franklin Railway Supply Co., Inc.

Grey Iron.
American Brake Shoe & Foundry Co.

Grinders, Internal.
Micro Machine Co.

Grinders, Portable Crank Pin.
Micro Machine Co.

Grinding Machines.
Sellers & Co., Inc., Wm.

Grinding Machines, Portable.
Ingersoll-Rand Co.
Ryerson & Son, Inc., Joseph T.

Guard Rails, Treated.
Curtin-Howe Corp.
International Creosoting & Construction Co.

Guard Rails, Foot Guard.
Q & C Co., The.

Guard Rails (One Piece).
Bethlehem Steel Co.
Ramapo Ajax Corp.

Guard Switch Point.
Q & C Co., The.

Guards, Cattle.
American Bridge Co.

Guards, Dust.
Gould Coupler Co., The.
Symington Co., The.

Hair Felt.
Johns-Manville Corp.

Hammers, Pneumatic.
Ingersoll-Rand Co.

Hammers, Riveting.
Ingersoll-Rand Co.

Hammers, Steam.
Industrial Brownhoist Corp.
Sellers & Co., Inc., Wm.

Hand Brakes—(See Brakes, Hand).

Hangers, Ball Bearing.
S. K. F. Industries, Inc.

Hand Rails & Fittings.
Aluminum Co. of America.

Hangers, Bottom Rod Safety.
Chicago Railway Equipment Co.

Hangers, Car Door—(See Fixtures, Car Door).

Headgates, Sliding
Armco Culvert Manufacturers Association

Headlight Repair Parts, Electric.
Electric Service Supplies Co.
Pyle-National Co.
Sunbeam Electric Mfg. Co.

Headlights, Electric.
General Electric Co.
Pyle-National Co., The.
Sunbeam Electric Mfg. Co.
Westinghouse Electric & Mfg. Co.

Headlights, Reflectors & Cases.
Pyle-National Co.
Sunbeam Electric Mfg. Co.

Heaters, Electric.
Gold Car Heating & Lighting Co.
Westinghouse Electric & Mfg. Co.

Heaters, Feedwater.
Graver Tank & Mfg. Corp.

Heaters, Feedwater Locomotive.
Coffin Co., Jr., The J. S.
Superheater Company, The.
Worthington Pump & Machinery Corp.

Heaters, Feed Water, Stationary.
Brill Co., The J. G.
Worthington Pump & Machinery Corp.

Heating & Ventilating Apparatus.
Gold Car Heating & Lighting Co.
Vapor Car Heating Co., Inc.
Westinghouse Electric & Mfg. Co.

Heating Equipment, Car.
Gold Car Heating & Lighting Co.
Safety Car Htg. & Ltg. Co.
Vapor Car Heating Co., Inc.
Wine Railway Appliance Co.

Heating Systems, Car (Electric and Steam).
Gold Car Heating & Lighting Co.
Safety Car Htg. & Ltg. Co.
Vapor Car Heating Co., Inc.
Wine Railway Appliance Co.

High Temperature Cements.
Carey & Co., Philip, The.

Highway Crossing Protection Devices.
American Bridge Co.
Franklin Railway Supply Co., Inc.
Griswold Signal Co.
Railroad Supply Co.

Hoists, Chain.
Milwaukee Electric Crane & Hoist Corp.
Ryerson & Son, Jos. T.

Hoists, Electric.
Milwaukee Electric Crane & Hoist Corp.

Hoists, Pneumatic.
Ingersoll-Rand Co.

Hoisting Machinery.
Industrial Brownhoist Corp.
Milwaukee Electric Crane & Hoist Corp.
Orton Crane & Shovel Co.

Hooks, Wrecking.
National Malleable & Steel Castings Co.

Horns, Pneuphonic.
Westinghouse Air Brake Co.

Hose, Air, Steam, Etc.
Ingersoll-Rand Co.
Westinghouse Air Brake Co.
Worthington Pump & Machinery Corp.

Hose, Oxy-Acetylene.
Oxweld Railroad Service Co., The.

Hose, Tender.
Westinghouse Air Brake Co.

Incandescent Lamps.
General Electric Supply Corp.

Indicators, Speed & Cut-off.
Valve Pilot Co.

Ingots.
Birdsboro Steel Foundry & Machine Co.
Carnegie Steel Co.
Edgewater Steel Co.
Illinois Steel Co.
McConway & Torley Co.
Standard Steel Works Co.

Injectors, Exhaust Steam.
Sellers & Co., Inc., Wm.
Superheater Co., The.

Inspection of Material and Equipment—(See Engineers, Inspection).

Insulated Wire.
American Steel & Wire Co.
Anaconda Wire & Cable Co.
General Electric Supply Corp.

Insulation, Car.
Carey Co., Philip, The.
Wood Conversion Co.

Insulation, Car, Bldg.
Carey Co., Philip, The.
JohnsManville Corp.
Lehon Co., The.
Tuco Products Corp.
Union Asbestos & Rubber Co.
Wood Conversion Co.

Insulation, Electrical.
General Electric Co.
Westinghouse Elec. & Mfg. Co.

Insulation, Exhaust & Heater Pipe.
Carey Co., Philip, The.
Johns-Manville Corp.
Tuco Products Corp.
Union Asbestos & Rubber Co.

Insulation, Heat.
Carey Co., Philip, The.
Miner, W. H.

Insulation Tape.
General Electric Supply Corp.

Insulators, Electrical, Porcelain.
Graybar Electric Co.
Westinghouse Elec. & Mfg. Co.

Interlocking Plant Equipment.
General Railway Signal Co.
Union Switch & Signal Co.

Iron Chain.
Falls Hollow Staybolt Co.
Lockhart Iron & Steel Co.
Ryerson & Son, Joseph T.

Iron, Charcoal.
Bethlehem Steel Co.
Ewald Iron Co.
Falls Hollow Staybolt Co.
Lockhart Iron & Steel Co.
Ryerson & Son, Joseph T.

Iron, Engine Bolt.
Lockhart Iron & Steel Co.
Logan Iron & Steel Co.
Ryerson & Son, Joseph T.

Iron, Forging Billets.
Lockhart Iron & Steel Co.
Logan Iron & Steel Co.

Iron, Hollow Staybolt.
Falls Hollow Staybolt Co.
Ryerson & Son, Joseph T.

Iron, Hollow Staybolt Bars.
Bethlehem Steel Co.
Falls Hollow Staybolt Co.
Ryerson & Son, Joseph T.

Iron, Pig.
Bethlehem Steel Co.

Iron, Refined.
Ewald Iron Co.
Falls Hollow Staybolt Co.
Lockhart Iron & Steel Co.
Reading Iron Co.
Ryerson & Son, Joseph T.

Iron, Staybolt — (See also Staybolts).
Ewald Iron Co.
Falls Hollow Staybolt Co.
Lockhart Iron & Steel Co.
Logan Iron & Steel Co.
Reading Iron Co.
Ryerson & Son, Joseph T.

Jacking, Locomotive.
Carey Co., Philip, The

Jacking Method of Installing Pipe
Armco Cuvert Manufacturers Association

Jacks, Smoke.
Carey Co., Philip, The.
Johns-Manville Corp.

Joints, Air Reservoir.
Barco Mfg. Co.
Franklin Railway Supply Co., Inc.

Joints, Blow Off Line (Roundhouse).
Barco Mfg. Co.
Franklin Railway Supply Co., Inc.

Joints, Coach and Coach Yard.
Barco Mfg. Co.
Franklin Railway Supply Co., Inc.

Joints, Flexible.
Franklin Railway Supply Co., Inc.
Vapor Car Heating Co., Inc.

Joints, Flexible Ball.
Barco Mfg. Co.

Joints, Rail.
American Steel Foundries.
Carnegie Steel Co.
Illinois Steel Co.
Q & C Co., The.
Rail Joint Co.
Union Switch & Signal Co.

Joints, Steam, Air & Liquid.
Barco Mfg. Co.
Franklin Railway Supply Co., Inc.
Vapor Car Heating Co., Inc.

Joints, Swing.
Barco Mfg. Co.
Vapor Car Heating Co., Inc.

Journal Boxes and Lids.
Allegheny Steel Co.
American Steel Foundries.
Brill Co., The J. G.
Gould Coupler Co., The.
Hunt-Spiller Mfg. Corp.
National Malleable & Steel Castings Co.
Pullman Car & Mfg. Corp.
Railway Steel Spring Co.
Symington Co., The.
Union Spring & Mfg. Co.

Journal Oilers, Car & Locomotive.
Ardco Mfg. Co.

Keys, Brake Shoe.
Bradford Corporation.
Buffalo Brake Beam Co.
Mt. Vernon Car Mfg. Co.
Steel Car Forge Co.
Union Spring & Mfg. Co.

Knuckles, Emergency.
Q & C Co., The.

Laboratories, Testing.
Hunt Co., Robert W.
Pittsburgh Testing Laboratory.

Lacquers.
General Electric Supply Corp.
Sherwin-Williams Co.

Ladders, Steel Car.
Wine Railway Appliance Co.

Lagging, Locomotive.
Carey & Co., Philip, The.
Johns-Manville Corp.

Lamps, Incandescent.
General Electric Co.
Graybar Electric Co.
Westinghouse Elec. & Mfg. Co.

Lamps, Inspector's.
Oxweld Railroad Service Co., The.

Lath, Metal.
Armco Railroad Sales Co.

Lathes, Axle.
Sellers & Co., Inc., Wm.

Lathes, Engine.
Ryerson & Son, Joseph T.

Lathes, Wheel.
Sellers & Co., Inc., Wm.

Lead, White.
National Lead Co.

Lighting Equipment, Car.
Electric Storage Battery Co.
Safety Car Htg. & Ltg. Co.

Lighting Fixtures and Systems.
General Electric Supply Corp.
Graybar Electric Co.
Pyle-National Co.
Safety Car Htg. & Ltg. Co.

Lighting Plants, Gas, Electric
Pyle-National Co., The.
Sunbeam Electric Mfg. Co.

Lightning Arresters.
General Electric Supply Corp.

Line Material.
Graybar Electric Co.
Westinghouse Elec. & Mfg. Co.

Lock Nuts—(See Nut Locks)

Locomotive Jacket Sheets.
Armco Railroad Sales Co.

Locomotive Water Conditioners
Bird-Archer Co., The.

Locomotives, Contractors.
American Locomotive Co.
Baldwin Locomotive Works.
Lima Locomotive Works.

Locomotives, Electric.
American Locomotive Co.
Baldwin Locomotive Works.
General Electric Co.
Westinghouse Elec. & Mfg. Co.

Locomotives, Gasoline.
Baldwin Locomotive Works.

Locomotives, Gas-Electric.
Brill Co., The J. G.
Electro-Motive Co.

Locomotives, Geared.
Lima Locomotive Works.

Locomotives, Industrial.
American Locomotive Co.
Baldwin Locomotive Works.
General Electric Co.
Lima Locomotive Works.
Westinghouse Elec. & Mfg. Co.

Locomotives, Mine.
American Locomotive Co.
Baldwin Locomotive Works.
General Electric Co.
Lima Locomotive Works.
Westinghouse Elec. & Mfg. Co.

Locomotives, Oil Engine, Electric Driven.
American Locomotive Co.
Baldwin Locomotive Works.
General Electric Co.
Ingersoll-Rand Co.
Westinghouse Elec. & Mfg. Co.
Whitcomb Locomotive Co., The.

Locomotives, Rebuilt.
American Locomotive Co.

Locomotives, Repair Parts.
American Locomotive Co.
Baldwin Locomotive Works.
Lima Locomotive Works.

Locomotives, Steam.
American Locomotive Co.
Baldwin Locomotive Works.
Lima Locomotive Works.

Locomotive Stokers.
Standard Stoker Co.

Locomotive Valve Pilot.
Valve Pilot Co.

Lubricators, Driving Box.
Franklin Railway Supply Co., Inc.

Lubricators, Piston Rod.
Q & C Co., The.

Lumber, Asbestos.
Carey & Co., Philip, The.
Johns-Manville Corp.

Lumber, Treated.
American Creosoting Co.
Central Coal & Coke Co.
Century Wood Preserving Co.
Curtin-Howe Corp.
Industrial Lumber & Creosoting Co.
International Creosoting & Construction Co.
National Lumber & Creosoting Co.
Southern Wood Preserving Co.

Machinery, Hydraulic.
Birdsboro Steel Foundry & Mach. Co.

Machine Screws, Monel Metal
International Nickel Co., The.

Magnets, Lifting.
Industrial Brownhoist Corp.
Electro Metallurgical Sales Corp.

Mechanical Draft Apparatus—(See Heating and Vent. App.).

Mechanical Stokers.
Standard Stoker Co.

Melters, Snow, Electric.
Q & C Co., The.

Metallic Flexible Conduit.
General Electric Supply Corp.

Meters, Water & Oil.
Worthington Pump & Machinery Corp.

Milling Machines, Planer Type.
Sellers & Co., Inc., Wm.

Milling Machines, Plain and Universal.
Ryerson & Son, Joseph T.

Milling Machines, Portable Frame Jaw.
Micro Machine Co.

Mohair Upholstery Velvets.
Chase & Co., L. C.
Massachusetts Mohair Plush Co.

Molybdenum Metal.
Vanadium Corp. of America.

Monel Metal, Rods, Sheets, Tubes, Wire, etc.
International Nickel Co., The.

Motors, Electric.
Fairbanks-Morse & Co.
General Electric Co.
Graybar Electric Co.
Westinghouse Elec. & Mfg. Co.

Motors & Generators.
Fairbanks-Morse & Co.

Moulding.
Aluminum Co. of America.

Multiple V Belt Drives.
Worthington Pump & Machinery Corp.

Nails.
American Steel & Wire Co.
Reading Iron Co.
Ryerson & Son, Joseph T.

Nipples, Air Hose.
Prime Manufacturing Co.

Nozzles, Exhaust.
Franklin Railway Supply Co., Inc.

Nozzles, Oxy-Acetylene Cutting.
Oxweld Railroad Service Co., The.

Nuts—(See Bolts and Nuts).

Nut Locks.
Dardelet Threadlock Corp.
Grip Nut Co.

Nuts, Tank Hose.
Prime Manufacturing Co., The.

Office Appliances.
Remington-Rand Business Service.

Oil-Electric Locomotives.
American Locomotive Co.
General Electric Co.
Ingersoll-Rand Co.
Westinghouse Elec. & Mfg. Co.

Oil Filtering & Storage Systems.
Graver Tank & Mfg. Corp

Oil, Linseed.
National Lead Co.

Oil Plugs, Steam Chest.
Franklin Railway Supply Co., Inc.

Oxy-Acetylene Apparatus.
Oxweld Railroad Service Co., The.

Oxygen.
Oxweld Railroad Service Co., The.

Packing.
Westinghouse Air Brake Co.

Packing, Air Pump.
Johns-Manville Corp.
Pilot Packing Co.
Union Asbestos & Rubber Co.
Westinghouse Air Brake Co.

Packing, Asbestos.

Packing, Cylinder and Valve Ring.
Johns-Manville Corp.
Hunt-Spiller Mfg. Corp.
Locomotive Finished Material Co.
Westinghouse Air Brake Co.

Packing, Locomotive Cab Cock.
Johns-Manville Corp.
Union Asbestos & Rubber Co.

Packing, Ring Boiler.
Union Asbestos & Rubber Co.

Packing, Semi-Metallic.
Pilot Packing Co.
Central Alloy Steel Corp.

Packing, Sheet.
Johns-Manville Corp.
Union Asbestos & Rubber Co.

Packing, Soft.
Carey & Co., Philip, The.
Johns-Manville Corp.
Pilot Packing Co.
Union Asbestos & Rubber Co.

Packing, Throttle.
Johns-Manville Corp.
Union Asbestos & Rubber Co.

Packing Valve Stem.

Paint Burners, Acetylene.
Oxweld Railroad Service Co., The.

Paint, Metal Protective.
Lowe Bros. Co., The.
National Lead Co.
Sherwin-Williams Co.

Paint, Powder.
Aluminum Co. of America.

Paint Spraying Equipment.
De Vilbiss Mfg. Co., The.

Paints.
Lowe Bros. Co., The.
National Lead Co.
Sherwin-Williams Co.

Paper, Carbon.
Remington-Rand Business Service.

Paper, Sheathing.
Carey & Co., Philip, The.

Patterns, for Iron, Steel & Brass Castings.
Baldwin Locomotive Works, The.

Pavement Breakers.
Ingersoll-Rand Co.
Worthington Pump & Machinery Corp.

Pickling Equipment, Monel Metal.
International Nickel Co., The.

Pile Drivers.
Industrial Brownhoist Corp.
Orton Crane & Shovel Co.

Piling, Treated.
American Creosoting Co.
Century Wood Preserving Co.
Curtin-Howe Corp.
International Creosoting & Construction Co.
National Lumber & Creosoting Co.

Piling, Sheet Steel.
American Bridge Co.
Carnegie Steel Co.
Inland Steel Company

Pilot Beams, Cast Steel.
General Steel Castings Corp.
Gould Coupler Co., The.

Pilots, Cast Steel.
General Steel Castings Corp.
Locomotive Finished Material Co.

Pins, Air Brake & Clevis.
Champion Rivet Co.

Pins, Center.
Miner, W. H.

Pins, Coupler Knuckle.
Champion Rivet Co.
McConway & Torley Co.
National Malleable & Steel Castings Co.

Pins, Crank.
American Locomotive Co.
Baldwin Locomotive Works.
Miner, Inc., W. H.
Standard Steel Works Co.
Union Asbestos & Rubber Corp.

Pipe, Corrugated Iron
Armco Culvert Manufacturers Association

Pipe, Paved Invert
Armco Culvert Manufacturers Association

Pipe Coverings.
Carey & Co., Philip, The.
Johns-Manville Corp.
Keasby & Mattison Co.

Pipe Fittings—(See Fittings, Pipe).

Pipe, Metal Culvert.
Armco Railroad Sales Co.
American Sheet & Tin Plate Co.
Republic Steel Corp.

Pipe, Perforated Iron
Armco Culvert Manufacturers Association

Pipe, Spiral Welded.
Armco Railroad Sales Co.

Pipe, Steel Signal.
National Tube Co.

Pipe, Spiral Welded.
Armco Railroad Sales Co.

Pipe, Wrought Iron.
Byers Co., A. M.
Reading Iron Co.

Planers, Plate.
Ryerson & Son, Jos. T.
Sellers & Co., Inc., Wm.

Plates.
Steel Car Forge Co.

Plates, Follower.
Steel Car Forge Co.

Plates, Boiler, Firebox—(See Steel Firebox).

Plates, Center—(See Bearings, Center).

Plates, Iron & Steel.
Armco Railroad Sales Co.
Carnegie Steel Co.
Illinois Steel Co.
Inland Steel Co.
Ryerson & Son, Joseph T.

Plate & Sheet Metal Work.
Baldwin Locomotive Works, The.

Plates, Tie.
Illinois Steel Co.
Inland Steel Company.
Railroad Supply Co.
Tennessee Coal, Iron & Railroad Co.

Plates, Tin and Terne.
American Sheet & Tin Plate Co.

Platforms, Car.
Gould Coupler Co., The.
Standard Coupler Co.

Platforms, Cast Steel, Passenger Car.
General Steel Castings Corp.

Plows, Railroad and Grading.
Western Wheeled Scraper Co.

Plows, Snow.
American Locomotive Co.
Brill Co., The J. G.
Q & C Co., The.

Plush, Mohair.
Chase & Co., L. C.
Massachusetts Mohair Plush Co.

Pneumatic Tools.
Ingersoll-Rand Co.

Poles, Signal.
American Creosoting Co.
Century Wood Preserving Co.
Curtin-Howe Corp.
General Railway Signal Co.
International Creosoting & Construction Co.
National Lumber & Creosoting Co.
Southern Wood Preserving Co.
Union Switch & Signal Co.

Poles, Treated.
American Creosoting Co.
Central Coal & Coke Co.
Century Wood Preserving Co.
General Electric Supply Corp.
Curtin-Howe Corp.
Graybar Electric Co.
International Creosoting & Construction Co.
National Lumber & Creosoting Co.
Southern Wood Preserving Co.

Poles, Steel Tubular.
Graybar Electric Co.
National Tube Co.

Posts, Fence, Treated.
Century Wood Preserving Co.
Curtin-Howe Corp.
Inland Steel Co.
International Creosoting & Construction Co.
National Lumber & Creosoting Co.
Southern Wood Preserving Co.

Posts, Steel Fence.
American Steel & Wire Co.
Q & C Co., The.

Powder, Blasting—(See Explosives).

Powdered Coal Equipment.
Muhlfeld, John E.

Power Plants.
General Electric Co.
Muhlfeld, John E.
United Engineers & Constructors, Inc.
Westinghouse Elec. & Mfg. Co.

Power Transmission Supplies.
Sellers & Co., Inc., Wm.

Preservatives, Wood.
Century Wood Preserving Co.
Curtin-Howe Corp.
National Lumber & Creosoting Co.

Presses, Flanging Hydraulic.
Birdsboro Steel Foundry & Machine Co.

Presses, Hydraulic.
Baldwin-Southwark Corp.
Birdsboro Steel Foundry & Machine Co.

Presses, Wheel.
Birdsboro Steel Foundry & Machine Co.
Sellers & Co., Inc., Wm.

Pulverizers, Coal — (See Crushers, Coal).

Pumping Stations.
Fairbanks-Morse & Co.

Pump Liners, Monel Metal.
International Nickel Co., The.

Pump Rods, Monel Metal.
International Nickel Co., The.

Pump Shafts, Monel Metal.
International Nickel Co., The.

Pumps, Hydraulic.
Ingersoll-Rand Co.
Worthington Pump & Machinery Corp.

Pumps & Pumping Mchy.
Fairbanks-Morse & Co.
Ingersoll-Rand Co.
Westinghouse Air Brake Co.
Worthington Pump & Machinery Corp.

Pumps, Vacuum.
Ingersoll-Rand Co.
Worthington Pump & Machinery Corp.

Punching and Shearing Machines.
Ryerson & Son, Joseph T.

Pushers, Coal.
Standard Stoker Co.

Pyrometers, Superheated Steam.
Superheater Co., The.

Rail Anchors.
Bethlehem Steel Co.
P. & M. Co., The.

Rail-Bonds.
American Steel & Wire Co.
General Electric Co.
General Railway Signal Co.
Graybar Electric Co.
Railroad Supply Co.
Union Switch & Signal Co.
Westinghouse Elec. & Mfg. Co.

Rail Braces — (See Braces, Rail).

Rail Reclamation Equipment.
Ryerson & Son, Joseph T.

Railroad Shops.
United Engineers & Constructors, Inc.

Rail Splice Plates — (See Joints, Rail).

Railroad Structures — (See Engineers and Contractors; also Building).

Rails.
Bethlehem Steel Co.
Carnegie Steel Co.
Illinois Steel Co.
Inland Steel Co.
Ryerson & Son, Inc., Joseph T.
Tennessee Coal, Iron & Railroad Co.
Thomson Rail Corp.

Railway Signals.
General Electric Supply Corp.

Rattan.
Hale-Kilburn Co.
Heywood-Wakefield Co.

Receivers, Air.
Ingersoll-Rand Co.
Westinghouse Air Brake Co.

Recorders, Speed & Cut-off.
Valve Pilot Co.

Rectifiers for Signal Work.
General Electric Co.
Railroad Supply Co.
Union Switch & Signal Co.

Reducing Valves.
Vapor Car Heating Co., Inc.

Reflectors, Headlight.
Pyle-National Co., The.
Sunbeam Electric Mfg. Co.

Refrigerators.
Wine Railway Appliance Co.

Regulators, Oxy-Acetylene.
Oxweld Railroad Service Co., The.

Relays.
General Railway Signal Co.
Railroad Supply Co.
Union Switch & Signal Co.
Westinghouse Elec. & Mfg. Co.

Removers, Paint & Varnish.
Oakite Products, Inc.

Repair Parts, Stoker.
Standard Stoker Co.
Q & C Company, The.

Retorts, Creosoting.
Graver Tank & Mfg. Corp.

Reverse Gear, Power.
Barco Mfg. Co.
Franklin Railway Supply Co., Inc.

Ringers, Bell
Hammett, H. S.

Rivet Cutters.
Ingersoll-Rand Co.

Riveters, Hydraulic.
Birdsboro Steel Foundry & Machine Co.

Riveting Machines.
Ingersoll-Rand Co.

Rivets.
Inland Steel Co.
Neely Nut & Bolt Co.
Ryerson & Son, Joseph T.
Pressed Steel Car Co.
Russell, Burdsall & Ward Bolt and Nut Co.

Rods.
Neely Nut & Bolt Co.

Rolled Steel.
Carnegie Steel Co.

Roller Bearings—(See Bearings, Roller).

Rolls, Bending & Straightening.
Birdsboro Steel Foundry & Machine Co.

Roof Slabs, Concrete.
Federal American Cement Tile Co.

Roofing, Asbestos.
Carey & Co., Philip, The.
Johns-Manville Corp.
Lehon Co., The.

Roofing, Buildings.
Armco Railroad Sales Co.
Carey Co., Philip, The.
Lehon Co., The.
Johns-Manville Corp.
Superior Sheet Steel Co., The (Division of Continental Steel Corp.).

Roofing, Car.
Armco Railroad Sales Co.
American Sheet & Tin Plate Co.
Carey & Co., Philip, The.
Hutchins Car Rfg. Co.
Johns-Manville Corp.
Lehon Co., The.
Superior Sheet Steel Co., The (Division of Continental Steel Corp.).
Tuco Products Corp.
Union Metal Products Co.

Roofing, Corrugated.
Armco Railroad Sales Co.
American Sheet & Tin Plate Co.
Carey Co., Philip, The.
Johns-Manville Corp.

Roofing, Tile.
Federal American Cement Tile Co.

Roofing, Tile, Cement.
Federal American Cement Tile Co.

Roofing, Tin.
American Sheet & Tin Plate Co.

Rope, Wire — (See Wire Rope).

Rust Preventatives.
Dearborn Chemical Co.
Oakite Products, Inc.

Safe Ends.
National Tube Co.

Sand Drying Plants.
Roberts & Schaefer Co.

Sanitary Products.
West Disinfecting Co.

Sash Balances.
Tuco Products Co.

Saws, Circular Metal.
Ryerson & Son, Joseph T.

Saws, High Speed, Friction.
Ryerson & Son, Joseph T.

Saws, Portable Rail.
Industrial Brownhoist Corp.
Q & C Co., The.

Scales.
Fairbanks-Morse & Co.

Scrapers, Wheeled and Drag.
Western Wheeled Scraper Co.

Screens, Passenger Car.
Tuco Products Corp.

Seats, Car.
Brill Co., The J. G.
Hale-Kilburn Co.
Heywood-Wakefield Co.

Seats, Coach.
Brill Co., The J. G.

Shafting.
Falls Hollow Staybolt Co.
Ryerson & Son, Joseph T.
Sellers & Co., Inc., Wm.
Standard Steel Works Co.

Shapers.
Ryerson & Son, Joseph T.

Shapes, Pressed Steel.
Pressed Steel Car Co.
Sellers & Co., Inc., Wm.

Shapes, Structural.
Bethlehem Steel Co.
Carnegie Steel Co.
Illinois Steel Co.
Inland Steel Co.
Ryerson & Son, Joseph T.

Sheds, Train.
American Bridge Co.
Inland Steel Co.

Sheets, Black and Galvanized.
Allegheny Steel Co.
American Sheet & Tin Plate Co.
Armco Railroad Sales Co.
Inland Steel Co.
Republic Steel Corp.
Ryerson & Son, Joseph T.

Sheets, Blue Annealed.
Allegheny Steel Co.

Sheets, Building, Special Car, Corrugated & Plain.
Armco Railroad Sales Co.

Sheets, Corrugated.
American Sheet & Tin Plate Co.
Armco Railroad Sales Co.
Carey Co., Philip, The.
Carnegie Steel Co.
Johns-Manville Corp.
Ryerson & Son, Joseph T.

Sheets, Corrugated & Plain.
Inland Steel Co.
Ryerson & Son, Joseph T.

Sheets, Electrical.
American Sheet & Tin Plate Co.
Armco Railroad Sales Co.
Republic Steel Corp.
Ryerson & Son, Joseph T.

Sheets, Iron & Steel.
Armco Railroad Sales Co.
Bethlehem Steel Co.
Superior Sheet Steel Co., The (Division of Continental Steel Corp.).

Sheets, Locomotive Jacket.
American Sheet & Tin Plate Co.
Armco Railroad Sales Co.
Inland Steel Co.
Ryerson & Son, Inc., Joseph T.

Sheets, Polished or Planished Iron.
Armco Railroad Sales Co.
American Sheet & Tin Plate Co.

Sheets, Steel.
Armco Railroad Sales Co.
Inland Steel Co.
Ryerson & Son, Joseph T.

Sherardising Plants.
General Electric Co.

Shop Calling Systems—(See Systems, Communication).

Shops, Railroad—(See Buildings, Iron, Steel and Steel Concrete).

Shovels & Draglines.
Industrial Brownhoist Corp.

Shovels, Steam, Gasoline & Electric.
Orton Crane & Shovel Co.

Siding, Iron & Steel.
Armco Railroad Sales Co.

Siding., Bldg., Car, Corrugated & Plain.
Kinnear Mfg. Co.
Armco Railroad Sales Co.
American Sheet & Tin Plate Co.
Inland Steel Co.
Ryerson & Son, Inc., Joseph T.

Siding, Corrugated & Plain.
Carey & Co., Philip, The.
Johns-Manville Corp.

Signal Accessories.
Electric Storage Battery Co.
General Electric Co.
General Railway Signal Co.
Graybar Electric Co.
Railroad Supply Co.
Union Switch & Signal Co.
Westinghouse Elec. & Mfg. Co.

Signals, Automatic Cab.
General Railway Signal Co.
Union Switch & Signal Co.

Signal Blades.
General Railway Signal Co.
Union Switch & Signal Co

Signals, Crossing.
Union Switch & Signal Co.

Signals, Crossing Protection.
General Railway Signal Co.
Railroad Supply Co.

Signals, Railway.
General Electric Co.
Union Switch & Signal Co.

Sign Posts, Treated.
Century Wood Preserving Co.
National Lumber & Creosoting Co.

Signs, Highway Crossing.
Railroad Supply Co.

Silico Manganese.
Vanadium Corp. of America.

Slabs, Concrete Floor.
Federal Cement Tile Co.

Slag, Blast Furnace.
Carnegie Steel Co.

Slotting Machines.
Sellers & Co., Inc., Wm.

Slotting Machines, Locomotive Cylinder.
American Steel & Wire Co.

Sludge Removers.
Bird-Archer Co., The.

Soap, Liquid.
West Disinfecting Co.

Solder.
National Bearing Metals Corp.
Ryerson & Son, Inc., Joseph T.
Westinghouse Elec. & Mfg. Co.

Spark Arresters.
Locomotive Firebox Co.

Speed Indicators & Recorders.
Valve Pilot Corp.

Spelter—(See Zinc).

Spikes.
American Steel & Wire Co.
Bethlehem Steel Co.
Illinois Steel Co.
Inland Steel Co.
Ryerson & Son, Joseph T.

Splice Bars, Angle.
Carnegie Steel Co.
Illinois Steel Co.
Inland Steel Co.

Spring Plates or Seats.
Allegheny Steel Co.
National Malleable & Steel Castings Co.
Union Spring & Mfg. Co.

Springs.
American Steel Foundries Co.
American Steel & Wire Co.
Baldwin Locomotive Works, The.
Pittsburgh Spring & Steel Co.
Railway Steel Spring Co.
Standard Steel Works Co.
Union Spring & Mfg. Co.
Union Switch & Signal Co.

Springs, Shop Equipment.
Ryerson & Son, Joseph T.

Springs, Vanadium Steel.
Pittsburgh Spring & Steel Co.
Union Spring & Mfg. Co.

Stacks, Steel.
American Bridge Co.
Graver Tank & Mfg. Corp.

Stands, Switch & Target.
Q & C Co., The.

Staybolts.
American Locomotive Co.
Ewald Iron Co.
Falls Hollow Staybolt Co.
Ryerson & Son, Joseph T.

Staybolts, Hollow.
Falls Hollow Staybolt Co.
Ryerson & Son, Joseph T.

Steam Chests.
Franklin Railway Supply Co., Inc.

Steam Enclosures, Corrugated Iron.
Republic Steel Corp.

Steam Shovels.
Orton Crane & Shovel Co.

Steel Alloy.
Illinois Steel Co.
Ryerson & Son, Joseph T.
Republic Steel Corp.
Standard Steel Works Co.

Steel, Firebox.
Carnegie Steel Co.
Illinois Steel Co.

Steel & Iron, Stainless.
Allegheny Steel Co.

Steel, Open Hearth.
Carnegie Steel Co.
Illinois Steel Co.

Steel Plate Construction.
Graver Tank & Mfg. Corp.

Steel, Pressed Specialties.
Hale-Kilburn Co.

Steel, Structural.
American Bridge Co.
Carnegie Steel Co.
Graver Tank & Mfg. Corp.
Illinois Steel Co.
Inland Steel Co.
Ryerson & Son, Joseph T.

Steel, Tool.
Illinois Steel Co.
Midvale Co., The.
Q & C Co., The.
Ryerson & Son, Joseph T.

Step Joints.
Q & C Co., The.
Rail Joint Co.

Steps, Car—(See Car Steps, Safety).

Stokers, Locomotive.
Standard Stoker Co.

Stokers, Mechanical.
Westinghouse Elec. & Mfg. Co.

Stoker Repair Parts.
Standard Stoker Co.

Storm Sewers, Corrugated Iron.
Republic Steel Corp.

Strainer, Air.
Westinghouse Air Brake Co.

Strainers, Tank Hose.
Prime Mfg. Co., The.

Stringers, Bridge, Treated.
American Creosoting Co.
Central Coal & Coke Co.
Century Wood Preserving Co.
Curtin-Howe Corp.
International Creosoting & Construction Co.
National Lumber & Creosoting Co.

Structural Shapes, Rolled Shapes.
Carnegie Steel Co.

Superheaters.
Superheater Co., The.

Supports, Bottom Rod Safety.
Chicago Railway Equipment Co.

Switch Boards.
Graybar Electric Co.
Johns-Manville Corp.
Westinghouse Elec. & Mfg. Co.

Switch Machines.
General Railway Signal Co.

Switch Movements.
Union Switch & Signal Co.

Switch Ties, Treated.
American Creosoting Co.
Century Wood Preserving Co.
Curtin-Howe Corp.
International Creosoting & Construction Co.
National Lumber & Creosoting Co.
Southern Wood Preserving Co.

Switches, Electric.
Electric Service Supplies Co.
General Electric Co.
Graybar Electric Co.
Westinghouse Elec. & Mfg. Co.

Switches & Switch Stands.
Ramapo Ajax Corp.

Syphons, Corrugated Iron.
Republic Steel Corp.

Syphons, Locomotive.
Locomotive Firebox Co.

Syphons, Locomotive, Boilers
Locomotive Firebox Co.

Tables, Welding.
Oxweld Railroad Service Co., The.

Tables, Welding.
Oxweld Railroad Service Co., The.

Tamping Machines, Tie.
Ingersoll-Rand Co.

Tamping Outfits, Tie.
Ingersoll-Rand Co.

Tank Cars.
Indian Refining Co.

Tanks, Acetylene, Gas.
Oxweld Railroad Service Co., The.

Tanks, Air, Gas, Oil and Water.
Baldwin Locomotive Works, The.
Graver Tank & Mfg. Corp.

Tanks, Water.
American Bridge Co.
American Locomotive Co.
National Tube Co.
Pressed Steel Car Co.
Westinghouse Air Brake Co.

Tape, Insulation.
Johns-Manville Corp.
Okonite Co., The.
Westinghouse Elec. & Mfg. Co.

Taps, Staybolt.
Ryerson & Son, Joseph T.

Tele. & Tele. Wire.
American Steel & Wire Co.
Anaconda Wire & Cable Co.
General Electric Supply Corp.

Terminals, Railroad.
United Engineers & Constructors, Inc.

Testers, Boiler.
Sellers & Co., Inc., Wm.

Testers, Gage.
Ashton Valve Co.

Testers, Rail.
Sperry Products, Inc.

Testers, Staybolt.
Flannery Bolt Co.

Testing Machines.
Baldwin-Southwark Corp.

Thermostats.
Gold Car Heating & Lighting Co.
Vapor Car Heating Co., Inc.

Tie Plates.
Bethlehem Steel Co.
Illinois Steel Co.
Inland Steel Company
Railroad Supply Co.

Ties, Creosoted.
International Creosoting & Construction Co.
National Lumber & Creosoting Co.
Southern Wood Preserving Co.

Ties, Steel.
American Bridge Co.
Bethlehem Steel Co.
Carnegie Steel Co.

Ties, Treated.
American Creosoting Co.
Century Wood Preserving Co.
Curtin-Howe Corp.
International Creosoting & Construction Co.
National Lumber & Creosoting Co.
Southern Wood Preserving Co.

Tile, Cement, Concrete.
Federal American Cement Tile Co.

Timber, Treated.
American Creosoting Co.
Central Coal & Coke Co.
Century Wood Preserving Co.
Curtin-Howe Corp.
International Creosoting & Construction Co.
National Lumber Co.
Southern Wood Preserving Co.
Wood Conversion Co.

Tires.
Firestone Tire & Rubber Co.
General Tire & Rubber Co.
Goodyear Tire & Rubber Co.
Goodrich Rubber Co., B. F.

Tires, Steel.
Edgewater Steel Co.
Midvale Co., The.
Railway Steel Spring Co.
Standard Steel Works Co.

Toilet Papers
U. S. Envelope Co.

Tools, High Speed Steel.
Bethlehem Steel Co.
Bird-Archer Co., The.

Towers, Floodlight.
Pyle-National Co.

Track Skates.
Q & C Co., The.

Tractors.
Caterpillar Tractor Co.
Elwell-Parker Electric Co.
Industrial Lumber Co.
International Creosoting & Construction Co.

Tractors, Industrial.
Elwell-Parker Electric Co.
International Harvester Co.

Tractors, Turntable.
Nichols & Bro., Geo. P.

Train Control Systems.
General Railway Signal Co.
Union Switch & Signal Co.

Tramways, Wire Rope.
American Steel & Wire Co.

Transfer Tables.
American Bridge Co.
Industrial Brownhoist Corp.
Nichols & Bro., Geo. P.

Transformers.
General Electric Supply Corp.
Railroad Supply Co.
Westinghouse Elec. & Mfg. Co.

Trap Doors.
Edwards Co., O. M.

Trap Doors & Fixtures.
Tuco Products Corp.

Traps, Steam.
Johns-Manville Corp.

Treads, Bridge Floor.
Carnegie Steel Co.

Treads, Safety.
Ryerson & Son, Joseph T.

Treatment Water—(See Water Softening and Purifying).

Truck Frames—(See Frames, Truck).

Trucks, Oxy-Acetylene Supply.
Oxweld Railroad Service Co., The.

Trucks, Car and Locomotive.
American Locomotive Co.
American Steel Foundries.
Baldwin Locomotive Works.
Bettendorf Company, The.
Birdsboro Steel Foundry & Machine Co.
Brill Co., The J. G.
Flexible Truck Co.
Franklin Railway Supply Co., Inc.
Gould Coupler Co.
Mt. Vernon Car Mfg. Co.
Pressed Steel Car Co.
Standard Car Truck Co.
Symington Co., The.

Trucks, Cast Steel Tender.
General Steel Castings Corp.

Trucks, Cast Steel, Electric Car.
General Steel Castings Corp.

Trucks, Cast Steel, Car and Locomotive.
General Steel Castings Corp.

Trucks, Electric Storage Battery.
Elwell-Parker Electric Co.

Trucks, Industrial.
Elwell-Parker Electric Co.

Trucks, Motor.
Dodge Motor Truck Corp.
General Motors Truck Co.
International Harvester Co.
Reo Motor Car Co.
White Co., The.

Trucks, Tender.
Flexible Truck Co.

Trucks, Trailer.
Brill Co., The J. G.
Franklin Railway Supply Co., Inc.

Tubes, Arch.
National Tube Co.

Tubes, Boiler.
Allegheny Steel Co.
Armco Railroad Sales Co.
Bethlehem Steel Co.
Globe Steel Tubes Co.
National Tube Co.
Ryerson & Son, Joseph T.

Tubes, Boiler, Charcoal Iron.
Bethlehem Steel Co.
Reading Iron Co.

Tubes, Staybolt.
Falls Hollow Staybolt Co.

Tubes, Tire.
Firestone Tire & Rubber Co.
Goodyear Tire & Rubber Co.

Tubing.
Aluminum Co. of America.

Tubing, Seamless Steel.
National Tube Co.

Tungsten Metal.
Vanadium Corp. of America.

Turbo Generators.
Electric Service Supplies Co.
General Electric Co.
Pyle-National Co.
Sunbeam Electric Mfg. Co.
Westinghouse Elec. & Mfg. Co.

Turnbuckles.
American Bridge Co.
American Steel & Wire Co.
Ryerson & Son, Joseph T.

Turntable Tractors.
Nichols & Bro., Geo. P.

Turntables.
American Bridge Co.
Industrial Brownhoist Corp.
Nichols & Bro., Geo. P.

Typewriter Ribbons.
Remington-Rand Business Service.

Typewriters.
Remington-Rand Business Service.

Uncoupling Device.
Hutchins Car Rfg. Co.

Undercrossings, Corrugated Iron.
Republic Steel Corp.

Underfloor Duct.
General Electric Supply Corp.

Underfloor Duct, Fibre and Metal.
Johns-Manville Corp.

Underframes, Cast Steel, Tender.
General Steel Castings Corp.

Underframes, Cast Steel, Freight Car.
General Steel Castings Corp.

Underframes, Steel.
Bettendorf Co., The.
Brill Co., The J. G.
Pressed Steel Car Co.
St. Louis Car Co.

Underground Conduit.
General Electric Supply Corp.

Upholstery, Car.
Brill Co., The J. G.
Chase & Co., L. C.
Massachusetts Mohair Plush Co.

Valve Caps.
Schrader's Son, Inc., A.

Valve Gears, Locomotive.
Pyle-National Co.

Valves, Air Brake.
Westinghouse Air Brake Co.

Valves, Back Pressure Acetylene.
Oxweld Railroad Service Co., The.

Valves, Balanced Slide
Hammet, H. G.

Valves, Blow-Off.
Bird-Archer Co., The.

Valves, Check & Angle Steam
Sellers & Co., Inc., Wm.

Valves, Drifting.
Ardco Mfg. Co.
Sellers & Co., Inc., Wm.

Valves, Hydraulic.
Birdsboro Steel Foundry & Machine Co.

Valves, Piston.
Franklin Railway Supply Co., Inc.

Valves, Pop, Safety & Relief.
Ashton Valve Co.
Vapor Car Heating Co., Inc.
Westinghouse Air Brake Co.

Valves, Pressure Regulating.
Gold Car Heating & Lighting Co.

Valves, Throttle.
American Throttle Co., Inc.
Bradford Corporation.

Valves, Fire.
Schrader's Son, Inc., A.

Varnish Powder.
Aluminum Co. of America.

Varnishes.
General Electric Supply Corp.
Lowe Bros. Co., The
Sherwin-Williams Co.
Vapor Car Heating Co., Inc.
Wine Railway Appliance Co.

Ventilators, Car.
Gold Car Heating & Lighting Co.

Ventilators, Shop & Roundhouse.
Carey Co., Philip, The.
Johns-Manville Corp.

Wardrobes, Rolling and Disappearing Front — (See Lockers).

Washers.
National Malleable & Steel Castings Co.
Ryerson & Son, Joseph T.
Wine Railway Appliance Co.

Washers, Boiler.
Sellers & Co., Inc., Wm.

Waterproofing Materials and Compounds.
Carey Co., Philip, The.
Johns-Manville Corp.
Lehon Co., The.

Water Purifying Materials & Compounds.
Bird-Archer Co., The.
Dearborn Chemical Co.

Water Softening & Purifying.
Bird-Archer Co., The.
Dearborn Chemical Co.
Graver Tank & Mfg. Corp.
Permutit Co., The.

Weather Stripping.
Tuco Products Corp.

Wedges, Automatic.
Franklin Railway Supply Co., Inc.

Wedges, Journal Box.
American Steel Foundries.
Gould Coupler Co.
National Malleable & Steel Castings Co.
Pressed Steel Car Co.
Symington Co., The.

Weed Killer.
Q & C Co., The.

Welding Machines, Acetylene.
Oxweld Railroad Service Co., The.
Ryerson & Son, Joseph T.
Westinghouse Elec. & Mfg. Co.

Welding Machines, Electric.
General Electric Co.
Ryerson & Son, Joseph T.

Welding Machines, Flue.
Ryerson & Son, Joseph T.

Welding Materials.
Oxweld Railroad Service Co.
Franklin Railway Supply Co., Inc.

Welding Process.
Oxweld Railroad Service Co.

Welding Rods.
American Steel & Wire Co.
General Electric Supply Corp.
Oxweld Railroad Service Co., The.
Ryerson & Son, Joseph T.

Welding Supplies.
General Electric Co.
Oxweld Railroad Service Co., The.

Welding and Cutting Apparatus—(See Cutting and Welding Apparatus).

Well Casings, Corrugated Iron.
Armco Culvert Mfrs. Assoc.
Republic Steel Corp.

Wheel Centers, Driving.
American Locomotive Co.
American Steel Foundries.
Baldwin Locomotive Works, The.
Birdsboro Steel Foundry & Machine Co.
Edgewater Steel Co.
Hunt-Spiller Mfg. Corp.
Standard Steel Works Co.
Union Steel Casting Co.

Wheels, Car and Locomotive.
American Locomotive Co.
American Steel Foundries.
Baldwin Locomotive Works, The.
Bethlehem Steel Co.
Carnegie Steel Co.
Edgewater Steel Co.
Illinois Steel Co.
Mt. Vernon Car Mfg. Co.
Pressed Steel Car Co.
Railway Steel Spring Co.
Standard Steel Works Co.

Wheels, Cast Iron, Chilled Tread.
Assn. of Mfrs. of Chilled Car Wheels.
Graybar Electric Co.
Griffin Wheel Co.
Mt. Vernon Car Mfg. Co.
Pressed Steel Car Co.

Wheels, Mine Car.
Carnegie Steel Co.
Edgewater Steel Co.
Mt. Vernon Car Mfg. Co.
Standard Steel Works Co.

Wheels, Passenger Car.
Carnegie Steel Co.
Illinois Steel Co.
Edgewater Steel Co.
Pullman Car & Mfg. Corp.
Standard Steel Works Co.

Wheels, Steel and Steel Tired.
American Locomotive Co.
American Steel Foundries.
Carnegie Steel Co.
Edgewater Steel Co.
Illinois Steel Co.
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Ashton Valve Co.

Whistles, Locomotive.
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Window Fixtures.
Edwards Co., O. M.
Tuco Products Corp.

Wire.
American Steel & Wire Co.
Kerite Insulated Wire & Cable Co.
Okonite Co., The.

Wire, Fence.
American Steel & Wire Co.

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American Steel & Wire Co.
Anaconda Wire & Cable Co.
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Graybar Electric Co.
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Wire, Telephone & Telegraph.
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Anaconda Wire & Cable Co.
Graybar Electric Co.

Wire, Welding.
American Steel & Wire Co.
Oxweld Railroad Service Co., The.

Wiring Appliances.
Pyle-National Co.

Wood, Treated.
Century Wood Preserving Co.
Curtin Howe Corp.
National Lumber & Creosoting Co.

Wood Preservative — (See Preservative, Wood).

Wood, Preservative Treatment (Zinc Meter Arsenic).
Century Wood Preserving Co.
National Lumber & Creosoting Co.

Wrecking Cranes — (See Cranes, Wrecking).

Z M A Wood Preservative (Zinc Metal Arsenite).
Curtin-Howe Corp.

Index To Advertisers

A

Allegheny Steel Co. 47
American Arch Co., Inc. The 34
American Locomotive Co. .. 35
American Sheet & Tin Plate Co. 14
American Steel Foundries . 13
American Steel & Wire Co. 14
Armco Culvert Manufacturers Association 3

B

Baldwin Locomotive Works, The 4
Barco Manufacturing Co. .. 42
Battey & Kipp, Inc. 48
Bettendorf Co., The 24
Bird-Archer Co., The 43
Bixby, Inc., R. W. 48
Buckeye Steel Castings Co., The 43
Buffalo Brake Beam Co... 47
Buyers' Index ....49 to 55 incl.
Byers Co., A. M. 21

C

Camel Co. 45
Carnegie Steel Co. 14, 36
Carey Co., Philip, The 18
Caterpillar Tractor Co. 12
Classified Advertisements .. 48

E

Edgewater Steel Co. 8-9
Elwell-Parker Electric Co., The 19

F

Fafnir Bearings, Inc. 23
Fairbanks-Morse & Co. 20
Falls Hollow Staybolt Co... 47
Firebar Corporation 38
Franklin Railway Supply Co., Inc. 31

G

General Railway Signal Co. 10, 11. 58
General Steel Castings Corp. 25
Get Together Department .. 48
Gulick-Henderson Co. 48

H

Hammett, H. G. 48
Harbison-Walker Refractories Co. 34
Hunt Co., Robert W. 48
Hunt-Spiller Mfg. Corp. .. 39
Hutchins Car Roofing Co... 30
Hyman-Michaels Co. 48

I

Illinois Steel Co. 14
International Nickel Co., Inc., The 2

K

Kerite Insulated Wire & Cable Co., The 43

L

Lehon Co., The 44
Lima Locomotive Works, Inc. 32, 33
Lockhart Iron & Steel Co. 22
Locomotive Finished Material Co. 47
Logan Iron & Steel Co. .. 47
Lowe Bros. 48

M

Magnus Co. 46
McConway & Torley Co., The 45
Muhlfeld, John E..... 48

N

National Bearing Metals Corp. 46
National Tube Co. 14
Nichols & Bro., Geo. P., The 47

O

Ohio Locomotive Crane Co., The 46
Okonite-Callender Cable Co., Inc., The 44
Okonite Co., The 44
Orton Crane & Shovel Co. 46

P

P. & M. Co., The 47
Pilot Packing Co., Inc. .. 47
Pittsburgh Spring & Steel Co. 48
Pittsburgh Testing Laboratory 48
Professional Directory 48

R

Railroad Supply Co., The .. 47
Railway Educational Bureau, The 48
Ramapo-Ajax Corp. 15
Republic Steel Corporation.. 37
Ryerson & Son, Inc., Jos. T. 47

S

Safety Car Heating & Lighting Co., The 45
Schaefer Equipment Co. .. 26
Simmons-Boardman Publishing Co. .....Front Cover, 57
Southern Wood Preserving Co. 44
Standard Car Truck Co. .. 46
Standard Steel Works Co. .. 27
Stucki Co., A. 47
Superheater Co., The 41

T

Timken Roller Bearing Co., The 16, 17
Tuco Products Corp. 47

U

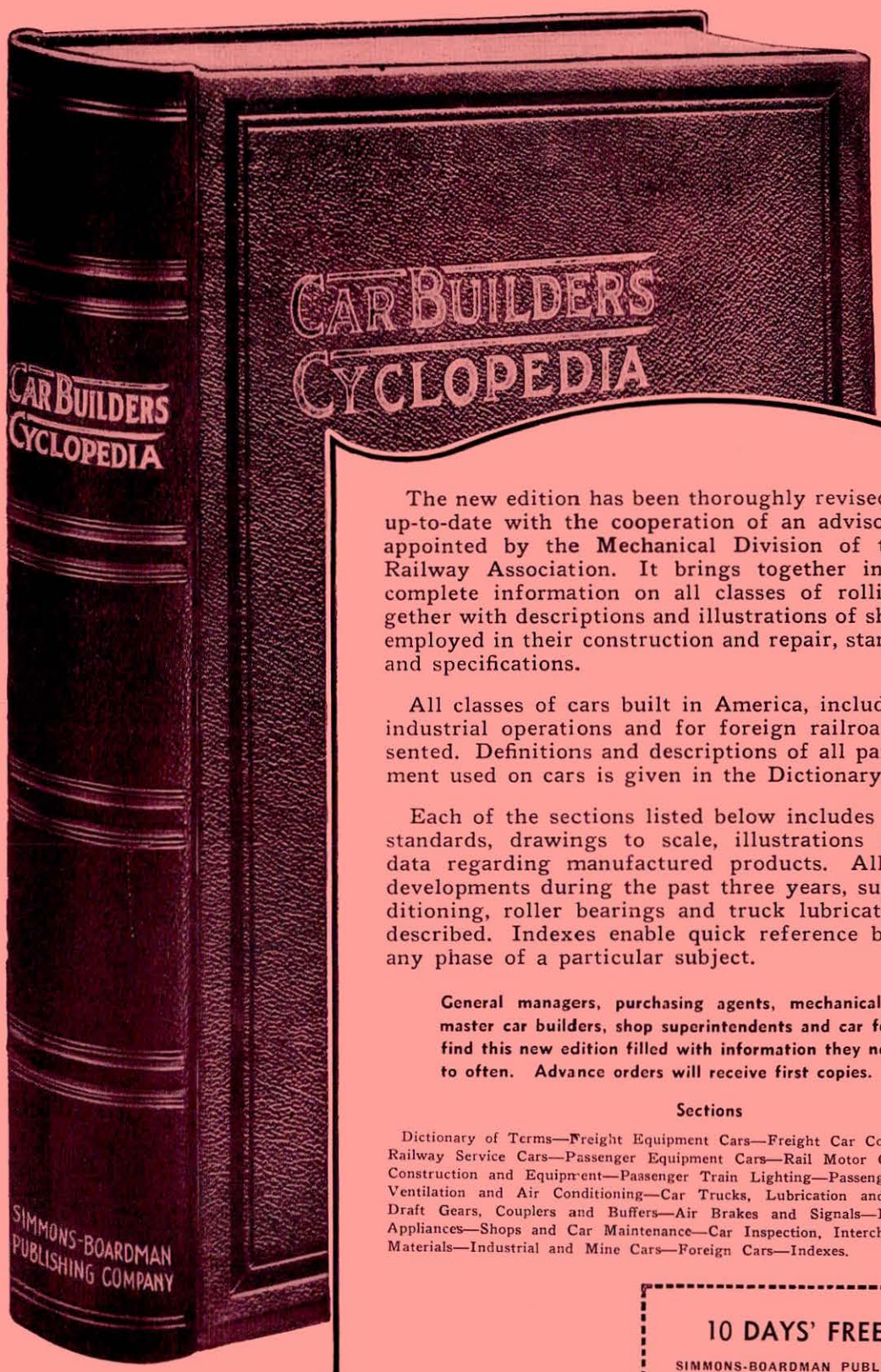
Union Asbestos & Rubber Co. 47
Union Metal Products Co. . 28
Union Spring & Mfg. Co. 47
Union Steel Casting Co. .. 47
Union Switch & Signal Co. 6-7, 58

V

Vapor Car Heating Co., Inc. 46

W

West Disinfecting Co. ... 45
Western Wheeled Scraper Co. 47
Westinghouse Air Brake Co. 40
Wheel Truing Brake Shoe Co. 46
Wine Railway Appliance Co., The 29



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